How do Dispositional Goal Orientations and Motivational Climate Interact to Affect Goal Valuation and Sport Performance in Athletes?

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Thesis submitted for the degree of Doctor of Philosophy

Department of Psychology

Durham University

June 2021

Total word count: 77,140

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Abstract

What psychological factors drive optimal athletic performance? Drawing on Nicholls' (1984) achievement goal theory (AGT), this thesis examines how different types of goals modulate the performance of recreational and elite athletes. Within AGT, the goal a person sets is influenced by their 'dispositional goal orientation' (DGO) that predisposes them to setting certain types of goals along with the 'motivational climate' (MC), which describe the environmental cues that indicate the type of goal that should be adopted. The DGO and MC are characterised in terms of the two conceptions of ability: task and ego. Task involvement is self-referent, focused on effort and mastery of skills. Ego involvement is externally referent, focused on winning, competition and external reward.

This thesis explores sport performance in terms of AGT and seeks to demonstrate which components are best for optimal athletic performance. Critically, gaps in the literature are identified as the lack of: (a) full DGO profiles of athletes accounted for, (b) objective sport performance measures and (c) robust analyses of the interactions between DGOs and MCs on sport performance. To counter this, this thesis' three experiments (*N*=138; 139; 154) included both subjective goal value and objective measures of performance as dependent variables, within a moderated regression analysis to test the interactions between MC manipulations and athlete DGO profiles. The key findings were that while task DGO and MC instructions led to higher goal valuation, objective performance was either unrelated to task DGO and MC or was actually optimal in ego MC instructions. Interaction effects also found ego MC to benefit performance in the majority of athlete DGO profiles. These results challenge the dominant narrative in sport psychology that task goals are preferable to ego goals. The implications are centred on reassessment of what constitutes sport performance and the application of factors that enhance it.

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List of Abbreviations

AGT – Achievement goal theory

DGO – Dispositional goal orientation

MC – Motivational climate

CSAI-2R – Competitive State Anxiety Inventory-2 Revised (Cox, et al., 2003)

PMCSQ – Perceived Motivational Climate in Sport Questionnaire (Seifriz et al., 1992)

PMCSQ-2 – Perceived Motivational Climate in Sport Questionnaire 2 (Newton et al., 2000)

POSQ – Perception of Success Questionnaire (Roberts & Balague, 1989; 1991)

TEOSQ – Task and Ego in Sport Questionnaire (Duda, 1989)

STVSQ – Subjective Task Value in Sport Questionnaire

Declaration

I declare that the work presented in this thesis is my own and has been generated by me as the result of my own original research. None of the data or material presented in the thesis has been submitted previously or simultaneously for consideration for a degree in this or any other university.

Acknowledgements

To my advisors, Dr. Daniel Smith and Dr. Judith Covey, for their immeasurable patience, support and guidance through the production of this thesis under unprecedented circumstances. Thank you for your unwavering support and commitment.

To Miriam Makim and Thomas Gourley, for all of their help and assistance with this research. Congratulations to you both for graduating with first class degrees.

To Aleksander Stavridis. Aleks, I am forever indebted to you. The truest friend with the brightest future. Congratulations on your Masters.

To Eleanor Byrne, Eleanor Hayes, Coach Lee and all of my Durham teammates, without whom I would not have mentally or emotionally made it through the long years that produced this work.

To the entire staff and faculty of the Department of Psychology at Durham University for their help and encouragement throughout my Masters and Doctoral work. Especially Norma Twomey, who kept me afloat many times.

Dedication

To Dr. Ala Hola, who set a trajectory for my life in motion, before I thought I was ready. I will miss being your SPSS assistant, your lectures I could barely keep up with, but most of all, time with you in your crowded office with the cuckoo clock going off. I'll never forget to "always, always, always, use a scatterplot!"

I dedicate this work to my family. Nothing I can say will ever be enough. To my parents, Mark and Michele Philyaw, who raised, encourage and help me to take on the world. To my brother, Zackary Philyaw, who battles all my battles alongside me. I have the time of my life fighting dragons with you. This PhD was only possible because of you three.

To my grandma, Patricia Monigold, and nana, Eleanor Philyaw. I am the direct combination of fearlessness and carefulness of you both. I feel you with me still.

Two doves used to roost under a rising moon;
Twin ash trees framed them like God's hands.
The skyline now reflects the stars of June
And a prairie quietly stretches overland.

Even without their roost, the doves continue
To watch over us – near enough to perceive,
Close enough to see and hear coo –
And always just out of reach.

When the night stills and all is said,
Come spring we shall unite again.
Until then, we search for your love
Gazing ahead, moonlight overhead
Praying to see our pair of doves.
- ZP

Till the end of time, and then on for eternity.

Chapter 1:

Introduction to Achievement Goal Theory and Sport Performance

The ultimate purpose of this research is to examine what factors motivate an athlete to perform their best from the perspective of Achievement Goal Theory (AGT; Nicholls, 1984). In general, people are motivated in different ways internally and by different things externally.

Motivation is a process actively influenced by personal dispositions within each person, known as the Dispositional Goal Orientation (DGO), and the contextual environment around them, known as the Motivational Climate (MC). According to AGT, DGO and MC both shape the goal for the present achievement situation, called the 'achievement goal'. Thus, the achievement goal is the persons' active involvement-state derived from their DGO and current MC. It is the value of this active achievement goal and how it motivates a person's behaviour which then affects their performance. Critical to this relationship, the question arises about whether the effects of DGO and MC on achievement goals and performance are independent of each other, or whether the effects of one are moderated by the other.

AGT further classifies DGO and MC by the two conceptions of ability, task conception and ego conception[1] (Nicholls, 1989; Ames 1992). Task DGO is intrinsically based, motivated by mastery and learning while ego DGO is extrinsically based, motivated by being better than others and rewards. It is important to highlight that task and ego DGO are orthogonal, meaning people have both and can have different levels of each (Nicholls, 1984). On the other hand, the MC is seen as more of one than the other (Ames, 1992). Task MC emphasises both self-referential goals for those involved, and cues in the environment that prioritize the role of effort in demonstrating competence. Ego MC emphasises creating goals based on comparison to others and an atmosphere that competitiveness and winning define success.

Fundamental to the theory, AGT holds that (1) DGO and MC both contribute to shaping the active achievement goal and that (2) task and ego DGO are orthogonal (Nicholls, 1984). The achievement goal shaped from the personal and situational factors

[1] The terms 'mastery' and 'performance' are sometimes used in place of task and ego when referring to DGOs and MCs; however, for the sake of simplicity, this thesis will refer to both DGOs and MCs with the 'task' and 'ego' terminology first used by Nicholls (1984).

then (3) motivate behaviour and affect performance (Dweck & Leggett, 1988; Nicholls, 1984). However, AGT research in general and in sports settings specifically tends to (1) explore DGO and MC separately, and (2) regard people as either more oriented towards task DGO or ego DGO, instead of orthogonally (Buch et al., 2016; Roberts, 2012). Finally, the existing research has largely (3) looked at how DGO and MC affect mental and psycho-social elements of motivation over objective behaviour and overt performance. The problem that arises from these tendencies is a lack of the full picture of how AGT is applied to sport performance. The question of how the basic principles of AGT affect actual performance are not fully answered if the principles are not all explored as interactions.

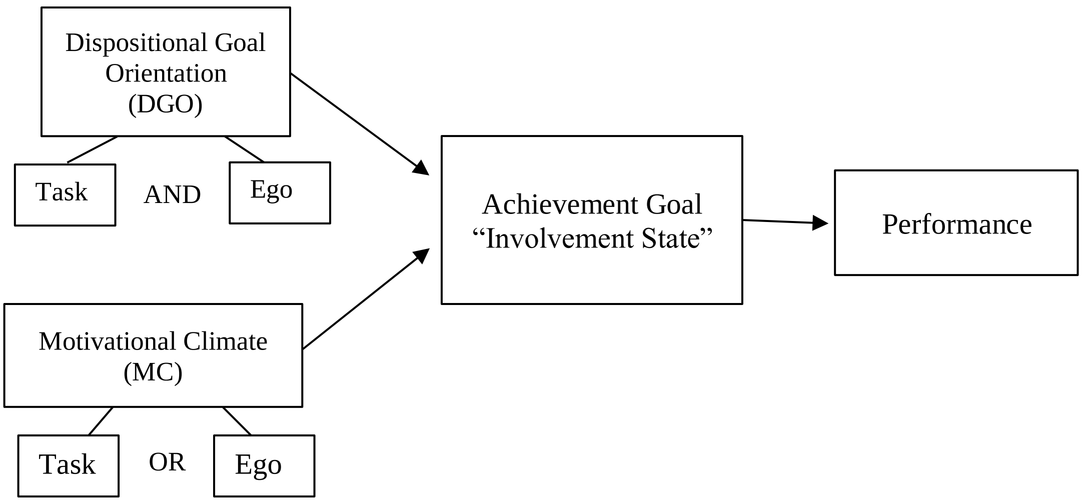

Figure 1. AGT Overview.

In AGT literature, across the domains of academic achievement, physical education and sport, there is a trend of support for task DGO and MC over ego DGO and MC (Dweck & Leggett 1988; Biddle, Wang, & Kavussanu, 2003; Kaplan & Maehr 2007). It is believed that the task conception, which prioritizes learning and effort, produces better outcomes. In sport research in particular, there are intervention studies on implementing task MCs in sport clubs and teams and decreasing ego MCs (Barkoukis et al., 2010; Cecchini et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls et al., 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom et al., 1995). These interventions increase the task MC and overtime have been found to then increase task DGO of the athletes, along with increasing their confidence, enjoyment, effort, satisfaction and positive affect. Conversely, by decreasing ego MCs they decrease ego DGOs as well. The outcomes of these interventions are shown to be positive; however, they do not measure objective athlete performance. The interventions also display an important implicit prediction of AGT as an interactionist approach (Lau & Nie, 2008; Maehr & Zusho, 2009). These interventions show that overtime intervention groups' perceived task MCs prevail over control groups, and along with the intervention, so does enhancement of task DGOs and diminishment of ego DGOs. In showing that athlete DGO overtime matched that of the MC, it displays a 'person-environment fit' perspective (Buch et al., 2016; Lau & Nie, 2008). This element of congruency, referred to before as a 'matching hypothesis' (Newton & Duda, 1999), holds that better performance occurs when DGO and MC are in harmony. This harmonious congruency fit implies the more the MC matches a persons' DGO, the more value they will hold for the achievement goal, thus the more motivated they become which allows for better performance. However, research in competitive elite sport has found that task DGO and MC are not necessarily better than ego DGO and MC for athletes (Kuczek, 2013), this congruency effect could offer an alternative explanation of why ego DGO and MC could be optimal for some and not others. In research that fails to implement an interactionist approach or experiments with actual sport performance variables, the full effects and benefits of AGT in sport will be missed. It is imperative to remember that the optimal achievement goal for performance varies according to the nature of the athlete and the MC they are in. This thesis explores this interactionist perspective by testing the interaction between the MC and DGO of the athlete across different performance variables.

Outline of argument

1. AGT is an interactionist theory that proposes that goals are the product of task and ego DGO and MC

2. AGT makes various explicit predictions about how different types of DGOs and MCs will influence psychological states and the strength of motivation. These largely predict that task DGO and MC are better

3. However, an implicit prediction of the theory is that MCs that are congruent with a person's levels of DGO will be more motivating than goals that are incongruent.

    a. Because the DGO reflects the person's beliefs about how worthwhile the goal is as a demonstration of their ability. If the criteria for successfully achieving a goal is not seen as providing a demonstration of competence (e.g. if one has high ego DGO but the task is ‘have fun’) it has no value, so will not motivate the participant

4. The literature has tested many of the predictions related to DGO and MC, largely finding that task DGO and MCs produce more desirable outcomes
5. However, the idea that congruence between DGO and MC is better than incongruence has not been explored in detail
    a. Prediction may be important when considering how best to motivate individuals, as it might suggest ego goals might be preferable, especially for those high in ego DGO

One factor that is critical to peak performance, or performing one’s best, is the athlete’s motivation. Broadly, AGT states that a person’s main achievement motive, or goal, in any achievement setting is to demonstrate competence. Competence in this context is the ability to fulfil the goal that is sought, therefore achieving a goal is a demonstration of competence. The achievement of a goal satisfies the drive to demonstrate competence and is rewarding to the person, thus encouraging them to pursue similar goals in future. By setting and achieving goals, individuals therefore create and sustain their motivation.

In this introductory chapter, this thesis introduces AGT and its evidence in sport research. The main findings of a systematic review of the literature on the dispositional and environmental aspects of AGT in sport performance studies will be discussed in this introductory chapter, and the review is reported in detail in Chapter 2. The systematic review demonstrates that a broad range of psycho-social factors have been examined with respect to motivation. The majority of these studies conclude that task DGOs and MCs are beneficial to athletes’ mental and emotional states over ego DGOs and MCs. This complements the overall conclusion drawn from the AGT literature in the educational domain. However, this review also identifies that very few studies relate these factors to objective sport performance measures or test for interactions between DGOs and MCs. The second part of this thesis comprises the experimental chapters, consisting of three studies reported in Chapters 3-5 that were designed to address key gaps in the literature as identified by the systematic review.

1.1 Achievement Goal Theory (AGT) Background

Different achievement goal theories were introduced in the 1970s and 1980s in classroom settings with children by the founding researchers: Nicholls, Maehr, Ames and Dweck (Ames, 1984; Dweck, 1986; Maehr, 1974; Maehr & Nicholls, 1980; Nicholls, 1984; 1989). These theories of achievement emerged alongside related social-cognitive achievement motivation theories, including attribution theory (Weiner, 1980), expectancy-value theory (Eccles 1983) and social-learning theory (Bandura, 1986). Collectively, these theories sought to understand the roles of various factors on academic achievement. The basis of these social-cognitive approaches is that achievement behaviour and performance are the result of the dynamic relationship between personal and environmental factors. They were rooted in the belief that ability conceptions, perceptions of the MC and DGO to set certain goals predict achievement behaviour.

Within AGT, each of the founding researchers contributed differently to the theory with later achievement goal research coming in the late 1990s (Elliot, 1999; Elliot & Church, 1997). The diverging theoretical approaches between the achievement goal theories derived from the authors' proposed antecedents of achievement goals and in the number of different achievement goals. The shared commonalities across these different approaches were first, the assumption that the desire to demonstrate ability is the primary motivating factor in achievement settings and second, that judgement of success or failure is dependent on how competence is defined according to that individual. The principles of AGT became incorporated in studies of academic attainment, physical education and sport (Duda, 1987; 1992; Roberts, 1984; 1992). Nicholls' (1984) approach to how individuals define competence and set goals arguably became the dominant theoretical framework (Roberts, 2012).

Nicholls (1984) developed AGT to explain why individuals adopt certain kinds of goals, and to make predictions about how these goals might influence their achievement behaviour. Notably, his approach espouses the intentional view of behaviour (Dennett, 1978) which is the notion that peoples' achievement behaviours are understood as attempts to achieve the purpose of meeting their goals efficiently. Achievement behaviour was originally defined as actions or behaviour motivated by the desire to develop or demonstrate high ability or to avoid demonstrating low ability (Kukla, 1978; McFarland & Ross, 1982). The distinguishing feature of Nicholls' AGT framework is that achievement behavior is the desire to show competence and avoid showing incompetence, adding the assumption that adults and adolescents are able to conceive ability or competence in two different ways. These two conceptions of ability are either 'task related,' which is self-referenced or 'ego related,' which is performance in reference to others. Task related and ego related conceptions of ability include different criteria for what constitutes competence or ability and ways to discern successful demonstration of ability or not. Task conception is defined by the process of learning, mastering and enjoying skills. It is intrinsically motivated, related to fun and effort is seen as positive because it leads to mastery and improved performance. Competence in task conception is a subjective, self-referenced experience marked by progress in learning or getting better at a skill. Ego conception is defined by the comparison of one's performance or results to others and/or external benchmarks. Competence in this state is extrinsically based, shown through superior performance in competition, winning external rewards and being better than others. Each of the major tenets of AGT (DGO, MC and achievement goal) will be briefly introduced before setting forth the original AGT predictions (Nicholls, 1984). Beyond the prediction section, each tenet will be more thoroughly evaluated and discussed how the AGT predictions of each have fared in the literature since.

For the first tenet of AGT, Nicholls' framework assumes that people have an innate tendency, called their Dispositional Goal Orientation (DGO), to construe competence as being either task or ego related. This, in turn, is an important personal factor involved in the goal setting process, since people may tend to set task or ego related goals based on their DGO. AGT framework posits that young children are naturally task oriented and self-referent. As a child begins to experience social spaces such as school, the conception of ego DGO and normative cues (e.g. comparing oneself to others) are introduced and slowly become a part of the child as they progress to adolescence. Then, individuals are able to differentiate between the two conceptions and naturally can assume whichever they are more comfortable with. Evidence for the distinction between the two DGOs was first demonstrated in the classroom, with support for the task and ego DGOs found across a variety of academic achievement settings (Ames, 1987, 1992; Ames & Archer, 1987; Dweck, 1986; Dweck & Elliott, 1983; Dweck & Leggett, 1988; Nicholls, 1984, 1989).

For the second tenet, AGT maintains there are ways that the achievement situation can be presented to people in order to create either a task or ego environment. While any type of neutral presentation will foster task involvement, it was believed ego involvement will be heightened if the situation is presented as (1) a test of valued normative-based skill, such as IQ tests (Patten & White, 1977), (2) a competition against others (Jagacinksi & Nicholls, 1984), or (3) public self-awareness is increased, such as becoming aware that others are watching you perform (Diener & Skrull, 1979; Scheier & Carver, 1983).

Expanding on Nicholls' (1984) AGT predictions of situational cues fostering either the task or ego involvement state, Ames (1992) referred to the situational level of the achievement goal process as the "motivational climate" (MC). The MC is defined as the perception of the psychological environment created by an important person in the external achievement situation, such as a parent, teacher or friend (Ames, 1992). In line with AGT (Nicholls, 1984), Ames posits the MC can be constructed to be either mastery (referring to task) or performance (referring to ego)[2]. A task MC is created when an important external source is perceived to emphasize self-improvement, effort and cooperation. An ego MC is created if an important external source is perceived to emphasize winning, competition against others or punishment for mistakes (Ames, 1992; Elliot & Dweck, 1988; Seifriz et al., 1992).

The subjective nature of achievement situations is expressed by the combination of the DGO and MC leading to the achievement goal. This is sometimes referred to as the active "involvement state" during the motivational process (Nicholls, 1984). AGT maintains that once an individual has learned the ego conception of ability, they can employ either the task or ego conception of ability as they see fit for the specific achievement setting. A person's DGO could influence the conception of ability they choose for the given achievement situation. It could also be the MC, or how someone in the external setting including a parent, teacher, coach, peer or experimenter has presented the goal that could influence which conception is actively chosen. It is argued that a person's achievement goal involvement state at any particular moment is difficult to directly measure because of its status as an active process that is dependent on the combination of DGO and the MC situational cues (Duda & Whitehead, 1998). Achievement goals are therefore a product of both personal DGO and situational MC that lead a person into defining and setting their goals.

Together, the DGO, MC and achievement goal comprise the major aspects of AGT. The relationship between the personal DGO and the external MC is what leads to the situational achievement goal or involvement state. More specifically, according to

[2] As noted before, though Ames (1992) does include the language 'mastery' (referring to task) and 'performance' (referring to ego) MCs, this thesis will still use the 'task' and 'ego' language based on Nicholls' original framework.

AGT's (Nicholls, 1984) intentional framework, a person's subjective experience (i.e. affective state, goal value) and performance in an achievement setting should differ in predictable ways according to the DGO and MC relationship and achievement goals they set.

1.1.1 AGT Original Predictions

The explicit predictions of AGT are classified into three categories, relating to goal choice, subjective experience, and performance[3]. Nicholls (1984) predicts that task or ego goals are set according to certain situations. These goals are then predicted to have an impact on the person's affect and performance. First, for goal choice, it is predicted that individuals would become task involved in non-competitive settings (i.e., neutral instructions) and ego involved in competitive settings. As mentioned before, competitive settings are predicted to be induced if the goal is presented in one of three ways: (1) as a test of valued skill, (2) competition with others is fostered, and (3) public self-awareness is heightened.

The second set of predictions are in regard to participant subjective experience, including attribution and affect. Nicholls (1984) explains that attributions are the causes that individuals attribute achievement outcomes to. Outcomes are attributed to either effort or ability. Effort attributions are seen as positive, in that people believe their success can be attributed to giving effort or trying hard. Even in failure, effort attributions are positive in that people believe they can keep practicing and try harder next time to achieve success. On the other hand, ability attributions are seen as negative and problematic in that people who attribute success or failure to ability believe you either naturally have the ability or not, and you cannot learn or improve with practice or effort. With ability attributions, successful outcomes are due to the person having the natural ability to succeed; however, failed outcomes then mean that the person does not have the natural ability to succeed and thus never will. The consequence of this belief is that failed mastery attempts lead to reduced motivation as people believe there is no point in trying because no amount of effort will result in success. It is predicted that task involvement

[3] There is a fourth category of 'task difficulty' where AGT makes predictions on the level of difficulty (easy, moderate or difficult) that a person will choose based on ego or task involvement and perceived ability. This thesis, however, is more focused on the other 3 main predictions of goal choice and how that leads to predictions of participants' subjective experience and performance. Allowing athletes to choose their own goals will attest for the manipulation of the MC but in doing so gives the athlete autonomy over their own goal difficulty as well. This was a necessary decision to focus on the main components and interactions of DGO and MC.

would increase positive effort attributions and emotional experiences, such as satisfaction and feelings of competence. It is predicted that ego involvement would increase negative ability attributions and emotional experiences, such as anxiety and a decreased interest in improvement and reduced intrinsic motivation.

The third set of predictions are predictors of performance. AGT predicts that task involvement will lead to more effort and more efficient performance compared to ego involvement. This is because in task involvement effort reflects the extent likely to produce improved mastery so will be given far more often than in ego involvement. Moreover, since learning is a desired outcome goal in task involvement, AGT predicts task involvement will be superior to ego involvement in the long-term sustainment of "real-world achievements," (Nicholls, 1984, p. 340) such as logical thinking and original scientific thought.

AGT predicts when a person is ego involved, effort will be high and produce effective performance, but only when it is perceived that high effort is necessary for high ability demonstration. In short duration experiments where requirements of success are clearly specified, it is predicted that ego involvement should not hurt performance and could even produce equal to better performance if perceived ability is high compared to task involvement (Nicholls, 1984). However, AGT also predicts that ego involvement will impair performance in low-perceived ability and anxious people when compared to task involvement. These low perceived ability people are also predicted to perform more poorly irrespective of their goal involvement state compared to high-perceived-ability individuals. Finally for the explicit predictions, AGT predicts there will not be any task or ego involvement condition effect for people with low anxiety.

Thus far, AGT makes various explicit predictions about how to manipulate goal choice and how these different types of achievement goal involvements will influence psychological states and the motivation towards effort. These generally predict that task involvement is better than ego involvement. However, one prediction that is implicit in AGT, but not well explored, is the idea that congruence between DGO and MC will produce more motivating achievement goals because they will be valued more. This implicit prediction is that the extent to which a task or ego MC motivates people depends on the level of each DGO. Thus, ego MCs will be more motivating as ego DGO increases, task MCs more motivating as task DGO increases. Since the actual achievement goal a person sets depends on their DGO and the MC, one of the main aims of this thesis is testing whether irrespective of their task DGO, if someone has a high ego DGO they will be more motivated by an ego MC than someone who has a low ego DGO. And similarly irrespective of their ego DGO, if someone has a high task DGO will be more motivated by a task MC than someone who has a low task DGO. In incongruence, because the DGO reflects the person's beliefs about how worthwhile the goal is as a demonstration of their ability, if the criteria for successfully achieving a goal is not seen as providing a demonstration of competence for them (e.g. if one has high ego DGO but the goal is to learn/try hard) it has no value, so will not motivate the participant to perform well.

To summarize, the predictions set forth by AGT favour task involvement over ego involvement for attribution responses, affect and effort in performance. Notable exceptions to the predictions by AGT are when ego involvement is used in short duration tasks and by people with high perceived ability. As will be shown in the following sections, there is good evidence for many of the explicit predictions. However, not as many studies test the implicit prediction that the motivational effect of the MC will be moderated by the strength of the DGO that aligns with the MC. Since achievement goals are the combination of DGO and MC, the focus on these tenets as main effects is problematic for predicting how AGT actually affects sport performance. In the following section AGT and its predictions will first be viewed in light of task and ego DGOs. A review of the predictions AGT makes with respect to MC will follow after. Following this will be a look at the evidence of congruency interactions.

1.2 Dispositional Goal Orientation (DGO)

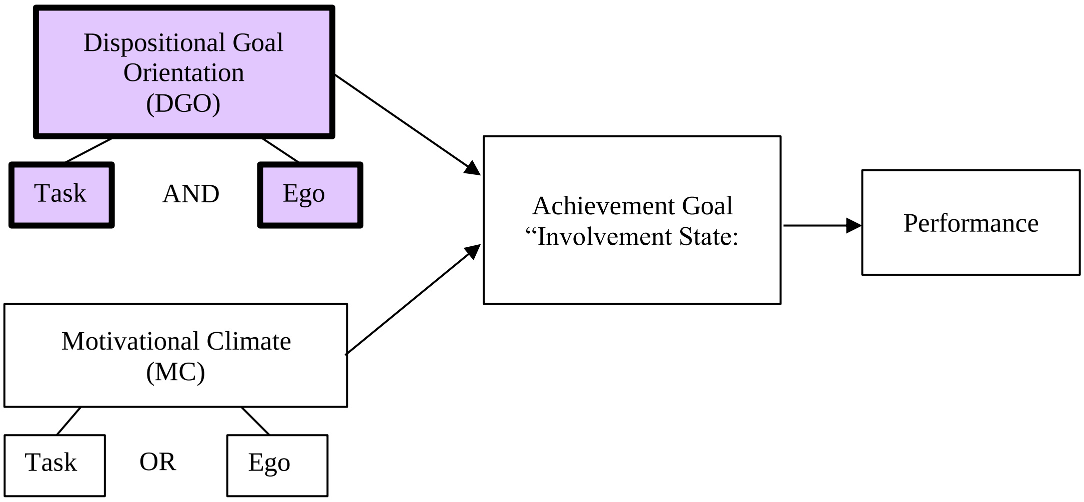

Figure 2. AGT Overview Focused on the DGO Variable.

According to AGT (Nicholls, 1984), task and ego DGOs are innate tendencies to set goals according to either the task or ego conception of ability. Task DGO is about intrinsic motivation, setting self-referent goals and success is considered mastery through practice, learning and effort. Ego DGO is about extrinsic motivation, setting goals in reference to others and success is considered doing better than competitors and winning prizes or status. Subsequent revisions to AGT by Elliot and colleagues added 'approach' and 'avoidance' elements to the task and ego DGOs. The first revision offered a trichotomous model that included goals of mastery (task), performance (ego) approach, and performance (ego) avoidance (Elliot & Church, 1997; Elliot & Harackiewicz, 1996). Soon after it included performance (ego) approach, performance (ego) avoidance, as well as mastery (task) approach, and mastery (task) avoidance (Elliot, 1999; Elliot & Dweck, 2005; Elliot & Thrash, 2001). Although these revisions attempted to encapsulate a more well-rounded DGO profile, the comparison of the four theoretical goals is not the focus of the current thesis because the two avoidance goals (performance/ego avoidance and mastery/task avoidance) are consistently negative and unrelated to enhanced performance (Hulleman et al., 2010).

In particular, performance (ego) avoidance goals are associated with higher anxiety, disorganized studying habits, avoidance of help-asking, self-handicapping, low interest and ultimately low achievement (e.g., Elliot & Church, 1997; Elliot et al., 1999; Midgley & Urdan, 2001; Wolters, 2004). Additionally, the negative effects that were historically attributed to ego goals uniquely characterize performance (ego) avoidance goals (for a review, see Elliot & Moller, 2003). Furthermore, mastery (task) avoidance goals are also associated with high anxiety, low self-efficacy, disengagement and poor performance (e.g., Van Yperen et al., 2009; for a review, see Moller & Elliot, 2006).

Thus, the theoretical subdivision of task and ego goals into approach and avoidance forms (Elliot, 1999; Pintrich, 2000) does not contribute to the current thesis' examination of enhanced performance. Because the concern of the current thesis is on what drives better performance, the focus is on the goals that are essentially approaching success rather than avoiding failure. This focus of the current thesis aligns with the approach used in Senko and colleagues' (2011) review of contemporary challenges to AGT, in which the focus on mastery (task) approach and performance (ego) approach goals are simply referred to as task and ego goals, respectively. It is argued that Senko and colleagues' (2011) review findings of approach goals are directly in line with the predictions and assumptions of Nicholls' (1984) original classification of task and ego goals. This means the original task and ego goals (Nicholls, 1984) are what is classified as the approach goals. Furthermore, a review of AGT by Urdan and Kaplan (2020) conclude that the distinction between approach and avoidance goals actually illuminate the distinction of self-worth concerns (avoidance goals) versus performance aims (approach goals). Diverting attention to avoidance goals, or goals that are avoiding failure and related to self-worth rather than approaching better performance with specific performance aims, would do a disservice to the point of examining the ways approach goals, the original task and ego DGOs as defined by Nicholls (1984), lead to better performance. Nicholls' (1984) AGT framework is still maintained in other current AGT research, thus this thesis focuses on the distinction between task and ego DGOs otherwise referred to in other research as "mastery-approach" and "performance-approach," respectively, for the purpose of exploring how DGOs facilitate better performance.

AGT makes predictions about how task and ego DGOs relate to attributions, affect, effort and performance. It was expected that task DGO would correlate with positive attributions, emotions and behaviours and ego DGO would correlate with negative attributions, emotions and behaviours, especially in individuals with low perceived ability. Two seminal studies examined personal DGO styles during and after the successes and failures of children. Diener and Dweck (1978) investigated children's performance, strategy, and achievement cognitions/attributions in a study with puzzles that increased in difficulty out of the range of the children's capacity. All children received the same puzzles in the same order and were asked to voice their strategies and thoughts during the process. In a similar experiment, Licht and Dweck (1984) had a group of students in an easy learning condition and a group in a difficult learning condition. In both experiments, regardless of the children experiencing the same scenarios, two DGO styles emerged: “mastery” (task) and “helpless” (ego) DGOs. Diener and Dweck (1978) found that helpless-oriented children immediately made ability attributions to their failure, their mood was negatively affected, and they gave up. However, mastery-oriented children did not make ability attributions to the failure, focused on trying harder, and began adaptive strategies to correct the mistake, which had a positive outcome on mood and perseverance. Licht and Dweck (1984) found in the easy learning condition the majority of both the mastery and helpless-oriented children were able to master the material, implying the differently oriented children's equal ability and positive response to non-difficult situations. This result shows that ‘helpless’ DGO is only a problem when confidence or perceived ability is low, echoing the claim made by Nicholls (1984). However, in the difficult condition a similar percentage of the mastery-oriented children mastered the material as in the easy condition, while only a small percentage of the helpless-oriented children were able to. They found the helpless-oriented children attributed failure to their lack of ability and other negative uncontrollable factors. Here, the task and ego goal states are seen as a part of a person’s belief system, or their disposition. The studies show that even though children are going through the same scenarios and outcomes, their DGOs resulted in different ways of handling and responding to the situation that was reflected in their attributions, emotions and perseverance in the ways predicted by AGT. Those that responded in the “mastery”/task DGO resulted in positive effort attributions, positive emotion and persistence. Those that responded in the “helpless”/ego DGO resulted in negative ability attributions, negative emotion and desertion. The only condition that this was not the case was in the easy condition, where there was no difference between the children categorized as having either task or ego DGO. These findings are in support of the AGT subjective experience predictions, that stated task involvement would lead to positive effort attributions and emotional experiences while ego involvement would lead to negative ability attributions and emotional experiences. The subjective experience predictions were also supported in subsequent studies (Butler 1987; Elliot & Dweck, 1988; Jagacinski & Nicholls, 1984; 1987; Miller, 1985).

Further research related specifically to task and ego DGOs found that these goal perspectives corresponded to student beliefs about the purpose of education (Nicholls, Patashnick & Nolen, 1985; Thorkildsen, 1988). Specifically, they found that task DGO was strongly related to the belief that education served to develop a person's understanding, social commitment and motivation to learn. In contrast, ego DGO was found to strongly relate to the belief that school was used in order to gain wealth and prestige. These findings led to the belief that there is a link between an individual's DGO in a specific setting and their value of what that setting has to offer them. This naturally led to investigations of DGOs and beliefs of the purpose of many achievement settings, particularly in sport.

1.2.1 DGO in Sport

Task and ego DGOs, as described in research into academic attainment, were found to generalize to the sport domain in initial sport research conducted in the 1980s (Duda, 1986; Ewing, 1981; Gill, 1986). Evidence of the two DGOs has since been demonstrated in the sport domain primarily based on the Task and Ego in Sport Questionnaire (TEOSQ; Duda, 1989) and the Perception of Success Questionnaire (POSQ) (Roberts & Balague, 1989; 1991). These questionnaires were created based on the work of Nicholls (1984; 1989) in order to determine athlete task and ego DGO in sport settings and allowed researchers to assess how the DGOs relate to sport beliefs, behaviour and performance.

Research drawn from the systematic literature review reported in full in Chapter 2 has shown that high task DGO is a positive asset in athletes. High levels of task DGO are associated with higher sport satisfaction (Balaguer, Duda, & Crespo, 1999; Smith, Balaguer, & Duda, 2006) and involvement based on effort and cooperation (Duda, 1989). Higher task DGO has also been found to positively relate to perceived performance improvement (Balaguer, Duda, Atienza, & Mayo, 2002), perceived competence (Bortoli, Bertollo, Comani, & Robazza, 2011; Bortoli, Messina, Zorba, & Robazza, 2012), perceived ability (Kim, Duda, & Gano-Overway, 2011) and sport confidence (Machida, Ward, & Vealey, 2012; Magyar & Feltz, 2003). Moreover, task DGO was found to positively correlate with other subjective measurements such as pleasant psychobiosocial states [e.g. athlete's performance state experience that includes the elements of emotion, cognition, and motivation (psychological), bodily reaction and movement (biological), and performance and communication (social)] (Bortoli et al., 2011; Bortoli, Bertollo, & Robazza, 2009; Bortoli et al., 2012), positive approach coping (Kim et al., 2011; Ntoumanis et al., 1999), perceived control (Pensgaard, 1999), positive affect (Ntoumanis et al., 1999), mental toughness (Beck et al., 2017), mindful engagement, practice strategy use and perceived peaking under pressure (Iwasaki & Fry, 2016). Lastly, high task DGO has been found to negatively predict unpleasant psychobiosocial states (Bortoli et al., 2009) and maladaptive coping (Ntoumanis et al., 1999).

In contrast, athletes with high ego DGO have been found to experience more performance anxiety when compared to athletes with high task DGO (Hall & Kerr, 1997; Ntoumanis & Biddle, 1998; Ommundsen & Pedersen, 1999). Athletes with high ego DGO scores are even thought to be predisposed to the occurrence of performance anxiety (Roberts, 1986). The systematic literature review also showed that ego DGO was related to worry and negative forms of coping such as venting, while being negatively related to positive coping such as acceptance (Abrahamsen et al., 2008a; Kristiansen et al., 2008; Ntoumanis et al., 1999), although ego DGO has been found to relate to positive variables such as perceived competence and confidence (Abrahamsen et al., 2008a; 2008b; Bortoli et al., 2011; 2012; Kim et al., 2011; Magyar & Feltz, 2003; Ntoumanis & Biddle, 1998), pleasant psychobiosocial states (Bortoli et al., 2011; 2009) and to good coach assessments of performance (Cervelló et al., 2007). Regardless of these positive findings, the consensus in reviews and intervention studies is that high task DGO fosters adaptive motivational and affective patterns that are more positive than having high ego DGO (Barkoukis et al., 2010; Cecchini, et al., 2014; Duda, 2001; Hassan & Morgan, 2015; Hogue et al., 2013; Mclaren et al., 2015; Nicholls et al., 2016; Smith et al., 2007; Theeboom et al., 1995).

A range of studies in sport have explored the AGT dichotomous framework of task and ego DGOs. A review of task and ego DGOs in the competitive sport context from 1989 through 2016 revealed across 260 studies that "the meta-analyzed intercorrelations supported the conceptualized interdependence of the two goal orientations" (Lochbaum, Çetinkalp, Graham, Wright & Zazo, 2016, p. 3). Even with support that the orientations are orthogonal, from the beginning AGT research has discussed people as being either task or ego oriented (Nicholls, 1984; 1989; Duda, 1989). The experimental work in this thesis, wanted to make sure to capture the athletes as whole profiles, exploring the interaction of their task and ego orientations, along with the three-way interaction of their task and ego orientations with MC instruction (which will be discussed last). Of the systematic literature review, only two studies incorporated the interaction 'ego orientation x task orientation' in their analysis (Iwasaki & Fry, 2016; Kim et al., 2011). Iwasaki and Fry (2016) included the interaction in their regression predicting mindful engagement, while Kim et al. (2011) explored controllability and approach coping. All three dependent variables were part of the coping strategies and controllability section of the literate review. A further study only looking at task and ego orientations included the interaction on its effect on somatic and cognitive anxiety (Li & Chi, 2007). All three studies, across the five variables, found the interaction to be non-significant. This could potentially be due to the interaction of task DGO and ego DGO not necessarily being influential on performance variables, but their interaction also amongst MC: the three-way interaction of MC x task DGO x ego DGO. This will be discussed later in the goal involvement section.

Overall, there is a substantial amount of evidence of task and ego DGOs and their effect across academic and sport contexts. The general consensus across contexts is that high task DGO leads to positive attributions, adaptive emotions and better perseverance, while high ego DGO leads to negative attributions, maladaptive emotions and more anxiety. However, this was not substantiated in the systematic literature review reported in Chapter 2. Although the studies sought to measure "performance," many result in the descriptions of emotional and mental affects (Abrahamsen et al., 2008a; 2008b; Bortoli et al., 2011; 2012; 2009; Iwasaki & Fry, 2016; Kim et al., 2011; Magyar & Feltz, 2003; Ntoumanis & Biddle, 1998; Ntoumanis et al., 1999; Pensgaard, 1999).

Although DGO is a very personal element of AGT, it is not the only factor that determines an individual's achievement goal. Achievement situations vary according to the situation's MC as well, as does the value people hold of those achievement goals. As AGT introduced, the goal setting process is personal but also adaptive to the environment. AGT predicts that certain MCs can alter a person's specific goal-involvement state for that particular moment.

1.3 Motivational Climate (MC)

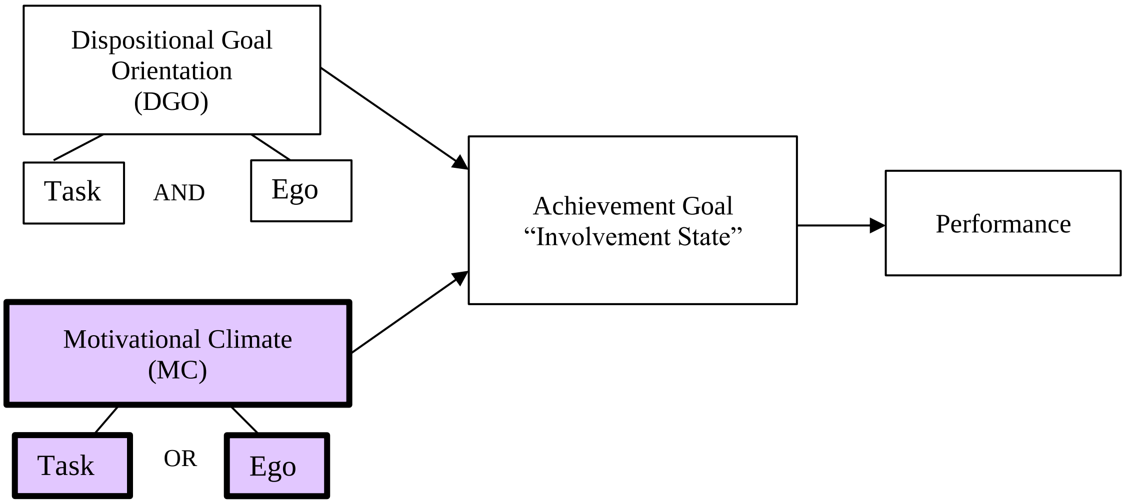

Figure 3. AGT Overview Focused on the MC Variable.

AGT holds that situational cues from the environment can also incline people to use either the task or ego conception of competence for that achievement setting. In later AGT work, Ames (1992) described these external factors such as, reinforcement, rewards, and feedback, as creating the 'MC.' Ames (1992) used the terms 'mastery' and 'performance' to represent the MC conceptions of 'task' and 'ego' respectively. In line with Nicholls' AGT research, the MC is predicted to elicit the task or ego conception when related situational factors are emphasized by authority or significant figures (i.e. experimenters, teachers, coaches) (Nicholls, 1984; Ames, 1992).

1.3.1 AGT MC Manipulations

According to the explicit AGT predictions (Nicholls, 1992), non-competitive settings should lead to people assuming task involvement while competitive settings should lead to people assuming ego involvement. Specifically, a task MC is assumed if directions are given in a neutral fashion, extrinsic rewards are not salient or the person is instructed to try hard, do their best or focus on learning. An ego MC is induced if the goal is presented in one of the three following ways described in the three following subsections: (1) fosters an increase in public self-awareness, (2) fosters competition with others, or (3) is an assessment of valued normative skills such as intelligence tests. The claim that the presentation of goals can have an influence on what type of goal a person sets is largely supported by work on induced and manipulated MCs in the original academic settings (Ames, 1984; Elliot & Dweck, 1988; Patten & White, 1977).

1.3.1.1 Public Self-Awareness. The prediction that an ego conception would be increased if there was an increase in a public self-view was supported by experiments that manipulated MC (Diener & Skrull, 1979; Scheier & Carver, 1983). Public self-awareness creates a social comparison perspective that someone then evaluates their own behaviour and results against. Diener and Skrull (1979) had university students make a number of perceptual judgements. By manipulating public self-awareness with voice recordings and television clips of peers showing their performance and scores, Diener and Skrull (1979) found that introducing this social norm led participants to start comparing their results to those of the peer norms they heard and saw. This was indicative of an ego MC. Participants who did not receive the manipulated MC compared their results to their own past tries, suggesting they were focused on task goals, indicative of a task MC. Scheier and Carver (1983) also found that when a normative group was introduced in their experiment it induced peer social comparison norms, which led participants to focus on ego goals. On the other hand, the lack of manipulated norm group introduction led to self-reinforcement by participants' own past tries at the activity, which led to task goals instead of ego goals.

1.3.1.2 Interpersonal Competition. The second prediction of the MC presentation is that competitive, rather than learning, goals foster ego involvement over task involvement. Ames (1984) and Elliot and Dweck (1988) manipulated the motivational context and student confidence in a classroom achievement setting in order to assess if given goals are the main determinant of patterns of achievement. The motivational context was manipulated with ego instructions such as "Let's see who is better at solving the puzzles… Who will be the winner?" and with task instructions such as "Let's see how many of these puzzles you can solve… Try to solve as many as you can" (Ames, 1984, p. 480). Investigations used a 2x2 design that manipulated high or low confidence and induced either competitive, aligning to ego MC, or learning, aligning to task MC conditions (Ames, 1984; Elliott & Dweck, 1988).

Both studies found that the learning (task) goal groups, regardless of high or low confidence, used self-instruction and showed positive, effective responses to failure.

Both studies also found the competitive (ego) groups with low confidence displayed negative affect and attributed failure to uncontrollable causes. A final main finding of both Ames (1984) and Elliott and Dweck (1988) is that the competitive (ego) groups with high confidence reacted in a manner associated with task as opposed to a 'helpless' manner, which is the negative reaction and affect, in regards to a lack of effort or trying, typically associated with ego involvement.

Another experiment looked at 5^{th} and 6^{th} grade, or roughly 10-11-year-old, students' depth of information processing in a computer word game within task-involved, ego-involved and control groups (Graham & Golan, 1991). The word game used in the study gave a list of words requiring both shallow and deep levels of processing and a recall test afterward measured their cognition performance. Researchers manipulated the motivational state by focusing subjects' attention on either task-involved or ego-involved instructions. The task-involved manipulation read to the students said that "if you concentrate on the task, try to see it as a challenge and enjoy mastering it, you will probably get better as you go along" (Graham & Golan, 1991, p. 189). The ego-involved manipulation insisted that "people are either good at these activities compared to other kids their age or they are not. So how you do will tell me something about how good you are at this kind of task" (Graham & Golan, 1991, p. 189). For the control group, only procedural information for how to complete the computer word game was given. This experiment found that students in the ego-involvement manipulation had poorer word recall in deep, but not shallow, processing levels compared to the task-involvement and control groups. This showed that ego-involvement resulted in reduced depth of processing, the understanding of the semantic meaning of the words, compared to other groups. This finding that under ego involvement the participants were less motivated to engage in the effortful, deep processing of the stimuli, is supportive of the AGT prediction that task involvement, over ego involvement, will lead to more effort.

1.3.1.3 Tests of Valued Skills. The third prediction is that ego MC would be increased if the task is presented as a test of a valued skill. More specifically, any type of valued skill that has normative scaling outcomes is said to elicit this response (Nicholls, 1984), such as intelligence quotient 'IQ' or specific workplace proficiency tests. It was found that these tests were ego-involved and had higher motivation if the test was directly related to an award afterward, such as being hired for a job (Arvey, Strickland, Drauden & Martin, 1990) or receiving money for every question answered correctly (O'Neil, Sugrue & Baker, 1996). In this way, it seems there is more effort and motivation if there is a valued reward that is obtainable afterwards, which contrasts with the last section that found ego-involvement to lead to less effort. It may come down to the level of value placed on what can be gained from the ego involved settings that determines the effort willing to be given.

Overall, the general consensus was that task involvement is more beneficial than ego involvement, mainly because task involvement is more stable in its belief in the efficacy of effort. Notably, Nicholls (1984) emphasized that even after a child or adolescent experiences ego conception via comparison in school, in order to maintain prolonged motivation, their environments should still choose to foster task MCs. As previously mentioned, effort attributions are seen as positive while ability attributions are seen as negative. Individuals experiencing task involvement have been found to hold more positive effort attributions, believing success is possible as long as they practice and keep trying hard. This persistence and effort have led to better outcomes (Ames, 1984; Butler, 1987; Elliot & Dweck, 1988; Graham & Golan, 1991; Jagacinsky & Nicholls, 1984; 1987; Stipek & Kowalski, 1989). It has even been claimed that exceptional creative achievements and high achievers in science and school in general are distinguished from others by higher levels of task involvement rather than ego (Spence & Helmreich, 1983; Nicholls, 1979). Although AGT in the educational domain largely favoured settings that allowed for task involvement over ego involvement, attention to how AGT can be generalized across domains from school to sport was had early on (Duda & Nicholls, 1992).

1.3.2 MC in Sport

The generalizability of AGT across domains from school to sport was paid attention particularly because of the competitive nature of sport (Duda & Nicholls, 1992). Competition is a foundational feature and integral to sport, more so than in educational settings. Since there is little generality across the natural MCs of each domain, it is suggested that general findings from education cannot be directly placed on sport (Coakley, 1986). Even though the climate within sport settings can be created or manipulated to be more task or ego related, the overall level of innate sporting competition means the conclusions from the education domain needed to be tested in the sport domain to assess generalizability (Duda & Nicholls, 1992). The original AGT prediction of goal choice, in which neutral instructions induces task involvement and creating public self-awareness, interpersonal competition and a test of valued skills induces ego involvement also is viewed in the sport domain.

In a cross-domain study, Duda and Nicholls (1992) examined the DGO, beliefs about the causes of success, perceptions of ability and satisfaction of 207 students, aged 14-17, across school and sport. It was found that there is good generality for DGO and success beliefs across school and sport. This showed that DGO and beliefs in what constitutes success do reflect stable traits of people across different domain specific MCs. However, perceptions of ability and satisfaction had no generality. This means the links between DGOs and perceived ability and satisfaction are different from educational to sport settings, potentially due to MCs (Duda & Nicholls, 1992). Sport-specific work that has followed examine psychological and performance variables according to MC. The majority of MC research in sport is derived by examining athlete's perceived MC. The AGT prediction that the presentation of the MC as competitive or externally referent would create an ego MC over task MC is demonstrated in sport by research looking at MC differences in training verse competition settings and experimentally manipulated MCs.

1.3.2.1 Perceived MC. The MC is generated by external factors evidenced by MC research in the original academic settings that used experimental manipulations and instructions. However, Ames (1992) also argues that individuals in the same setting can vary in their perception of the MC. This is called the perceived MC. Research in sport psychology has mainly focused on measuring this perceived MC instead of manipulating climates (Kavussanu, 2006; Gano-Overway, Guivernau, Magyar, Waldron & Ewing, 2005; Miller, Roberts & Ommundsen, 2004; Ommundsen, Roberts, Lemyre & Treasure, 2003). The large majority of sport research relies on using the Perceived Motivational Climate in Sport Questionnaire (PMCSQ; Seifriz et al., 1992) or PMCSQ-2 (Newton, Duda, & Yin, 2000) to measure athlete perceived MC.

The PMCSQ (Seifriz et al., 1992) was based on the two goal states found in Nicholls (1984) and expanded on the academic work of Ames and Archer (1988) into sport settings. It measures a person's perception of the goal perspective within their sport environment, assessing if the athlete finds it is more task-involving or ego-involving. In an atmosphere that is found to be more task-focused, athletes believe that hard work is rewarded, the coach is a source of positive encouragement and every member has a role on the team or within the club. In an atmosphere that is found to be more ego-focused, athletes believe they are pitted against their teammates to prove themselves, mistakes are punishable, and the coach only recognizes those with the most natural ability.

Within AGT sport literature, the general consensus is that perceived task MCs lead to better overall psychological well-being and enjoyment due to the focus on effort, learning and improvement while perceived ego MCs create performance anxiety due to the focus on winning, ability over effort and punishment for mistakes (Balaguer et al., 1999, 2002; Granero-Gallegos et al., 2017; Newton et al., 2000; Pensgaard and Roberts, 2000; Duda, 2001; Atkins et al., 2015). It was also found that athletes that perceive a team task MC report more enjoyment, satisfaction, and intrinsic motivation regardless of their win/loss record (Quested & Duda, 2010; Reinboth & Duda, 2006; Seifriz et al., 1992). Further studies have found athletes with perceptions of a task MC were less anxious of performing bad while those that perceived an ego MC reported more anxiety to perform well, more perfectionism tendencies and more burn out and boredom (Granero-Gallegos et al., 2017; McArdle & Duda, 2004; Smith et al., 2015; Walling, Duda, & Chi, 1993).

The systematic literature review conducted for this thesis also had similar findings, with all studies measuring the perceived MC without manipulation and favouring perceived task MC over perceived ego MC (see Chapter 2). Perceived task MC was positively related to perceived sport ability and sport confidence (Abrahamsen et al., 2008a; 2008b; Kim et al., 2011; Machida et al., 2012; Magyar & Feltz, 2003), peaking under pressure (Iwasaki & Fry, 2016), pleasant psychobiosocial states (Bortoli et al., 2011; 2009; 2012), mindful engagement, controllability and approach coping strategies (Iwasaki & Fry, 2016; Kim et al., 2011; Kristiansen et al., 2008; Ntoumanis et al., 1999), perceived improvement and use of improvement strategies (Balaguer et al., 2002; 1999; Iwasaki & Fry, 2016), satisfaction with level of play and results (Balaguer et al., 2002; 1999), VO_{2max} run performance (Buch et al., 2016) and self-assessment of match performance (Cervelló et al., 2007). A perceived task MC was only negatively related to the experience of unpleasant psychobiosocial states (Bortoli et al., 2009; 2012) and psychological difficulties (Kim et al., 2011) and not positively related to any negative outcomes at all. On the other hand, a perceived ego MC was only positively related to two positive outcomes: approach coping (Kim et al., 2011) and satisfaction with level of play (Balaguer et al., 1999). Beyond this, a perceived ego MC was positively related to negative outcomes such as the experience of unpleasant psychobiosocial states (Bortoli et al., 2009; 2012), worry and concentration disruption (Abrahamsen et al., 2008a), psychological difficulties (Kim et al., 2011), and avoidance and maladaptive coping strategies (Kim et al., 2011; Kristiansen et al., 2008; Ntoumanis et al., 1999) while negatively related to positive outcomes such as perceived ability (Kim et al., 2011), coach's leadership and social support (Abrahamsen et al., 2008b; Magyar & Feltz, 2003), mindful engagement (Iwasaki & Fry, 2016) and lastly satisfaction with results (Balaguer et al., 1999).

These findings support the AGT predictions that task MC involvement would lead to positive emotional experiences, such as better psychological well-being, and ego MC involvement would lead to negative emotional experiences, such as more anxiety and dissatisfaction. The findings also support the AGT predictions that task involvement over ego involvement would lead to more positive long-term sustainment of achievement, as found in the task MCs leading to more self-motivated practice and ego MCs leading to more boredom. The inconsistency here is that AGT originally made predictions of goal choice and listed the ways to manipulate either task or ego MCs; however, the sport research reviewed so far has measured perceived MCs without manipulating them. This measurement issue could potentially show that perhaps perceived MCs are more in line with the participants' DGOs than with a manipulated MC setting as there is evidence of correlation between perceived MC and a corresponding DGO (Granero-Gallegos et al., 2017).

Granero-Gallegos and colleagues (2017) found that training sessions were perceived as more oriented towards a task MC while competitions were perceived as more oriented towards an ego MC. In line with the research discussed, they also found that perceived task MCs related to task DGO, enjoyment, more self-motivated practice and the belief that success occurs through effort. In contrast, perceived ego MCs related to ego DGO, boredom, deceptive tactics, and the belief that success happens through innate abilities. Similarly, Van de Pol and Kavussanu (2012) found that task DGO has been found to be higher in training while ego DGO has been found to be higher in competition.

1.3.2.2. Training vs Competition MC. That natural competitive elements of sport are featured particularly in the competition games or matches (ego MC), with more learning and working on personal skills being featured during training sessions (task MC)

(Van de Pol & Kavussanu, 2012; Van de Pol et al., 2012). Research into training vs competition atmospheres have looked at how DGO and other outcome elements differ between the two along with adding the measurement of perceived MC to see if perceptions match the assumptions that training is more task-based and competition is more ego-based (Van de Pol et al., 2012). The AGT prediction that the presentation of the MC as competitive, instead of learning, would foster ego involvement over task involvement is demonstrated in sport by research looking at perceived MCs in training verse competition settings.

Two studies specifically examined if athletes hold DGOs across training (task MC) and competition (ego MC) and how this MC difference affected levels of effort, enjoyment and tension within each (van de Pol & Kavussanu, 2011; Van de Pol et al., 2012). These studies used the POSQ to measure the athletes' DGO as either task or ego. The Intrinsic Motivation Inventory (IMI) measured the effort, enjoyment and tension variables while the MC was manipulated by orienting each of the questions within the questionnaire with "during training…" that elicited a task MC and "during competition…" that elicited an ego MC.

The first study was conducted with 116 tennis players who ranged in level from club to international (Van de Pol & Kavussanu, 2011) while the other study was conducted with 410 football players ranging from club to regional level (Van de Pol et al., 2012). In addition to the IMI, Van de Pol & Kavussanu (2011) also tested for the tennis players' skill use with the Test of Performance Strategies (TOPS; Thomas, Murphy & Hardy, 1999). The TOPS is a self-report measure that indicates athletes' use of psychological skills and strategies during training and competition.

In the study with tennis players, athletes reported significantly higher task DGOs in training than competition and significantly higher ego DGOs in competition compared to training (Van de Pol & Kavussanu, 2011). Similarly, in the study with football players, when athletes were in competition their perceived ego MC their ego DGO and increased. However, data also showed that task DGO stayed the same across both contexts of training and competition (Van de Pol et al., 2012), giving evidence for the stability of task DGO. These findings suggest that DGOs may change based upon what the MC calls for, in order to match the environment, which heeds the situational predictions posited by AGT for goal choice. In addition, task DGO and task MC demonstrated to be more stable than ego DGO and ego MC which fluctuated more in these contextual adaptations.

In exploring how these DGOs and MCs could relate to effort and expected skill use, Van de Pol and Kavussanu (2011) found by hierarchical regression analysis that the tennis players' task DGO significantly predicted effort as well as skill use in performance in both contexts, while ego DGO only significantly predicted effort in competition. Ego DGO did not relate to any skill use in performance regardless of context. Similarly, Van de Pol and colleagues' (2012) main finding was that effort and enjoyment were best predicted by a training context, task DGO and perceived task MC, while these variables had no relation to tension. The variable of perceived MC, added to this study and measured by the PMCSQ, found that a perceived ego MC negatively affected effort in both contexts. Lastly, tension did not have a relationship with perceived task MC. Tension was, however, predicted by a perceived ego MC only in the training context. This indicates that a perceived ego MC should not always be considered stressful in an actual competition setting, because it is expected and can dealt with accordingly.

Even though it was found that training is more in line with task MC and competition with ego MC, evidence has shown that training contexts can be influenced as more task or ego by coaches. Athletes who are subjected to task MC training sessions experience better psychological well-being compared to athletes subjected to competitive ego MC training sessions, who experience anxiety and dissatisfaction (Agans, Su & Ettekal, 2018; Balaguer et al, 1999; 2002; Beck, Petrie, Harmison & Moore, 2017; Duda, 2001; Jaakkola, Ntoumanis & Liukkonen, 2016; Pensgaard & Roberts, 2000; Smith, Smoll & Cumming, 2007; Vazou et al., 2006). Therefore, it is important to know that manipulations of the MC do have an effect on the perceived MC and outcomes, regardless of the overall setting of either training or competition. The following studies experimentally manipulated MCs to test for these effects. The following section looks at the research of experimentally manipulated MCs and how it relates to sport outcomes.

1.3.2.3 Experimentally Manipulated MC. Three studies examined the effect of manipulated MCs on perceived MC, subjective experience and sport performance in a juggling experiment (Hogue, Fry, Fry & Pressman, 2013), penalty kick experiment (Gershgoren, Tenenbaum, Gershogoren & Eklund, 2011) and rock climbing experiment (Sarrazin, Roberts, Cury, Biddle & Famose, 2002). All three studies manipulated the MC through instructions given to the task and ego MC between-subjects groups. For the task MC groups, instructions were focused on doing one's best, develop ability and personal improvement while for the ego MC groups, instructions were focused on public social awareness comparison and interpersonal competition.

In the juggling experiment, researchers sought to determine how the manipulated task and ego MCs affected participant's physiological cortisol stress response via salivary free-cortisol concentration along with their psychological responses of anxiety, enjoyment, effort, stress, shame and self-consciousness via questionnaires. All participants were given an introduction to juggling with a breakdown of the steps and tips on how to start. The experimental MC manipulations used both social awareness and fostered competitiveness. Task MC was induced by encouraging feedback to focus on skill performance improvement and effort. The task MC group was created with the emphasis on helping and supporting each other and working as a group to get a group best score. Ego MC was induced by feedback that only praised the best performers and groups were created solely to rank participants from best to worst. The ego MC group then had to compete against each other in a tournament until one person outperformed the rest. Physiological and psychological responses within the two MC states found that participants in the ego MC group experienced more anxiety, stress, shame, self-consciousness and negative physiological responses such as increased cortisol compared to participants in the task MC group, whom experienced greater enjoyment, effort, self-confidence and interest to continue juggling. These findings support the positive benefits of a task MC and the negative attributes of an ego MC first hypothesized in original AGT research (Nicholls, 1984).

The penalty kick (Gershgoren et al., 2011) and rock climbing (Sarrazin et al., 2002) studies also included measurements of the athletes DGO, involvement states and objective sport performance. After discussing their manipulated MCs and their effect on perceived MC, the rest of the results are a combination of the other elements and will therefore be discussed in the following two sections about involvement states and objective performance.

An experimental study measured effort and objective performance in a climbing task, within either a manipulated task or ego MC, of 78 boys (*M* age = 13.6 years, *SD* = 1.6) who had been taking rock climbing classes for over a year (Sarrazin et al., 2002). The MC was induced by an experimenter instructing it was either a private lesson to increase their ability for a task MC or as a competition based on completion points with results publicly displayed at the end of the experiment for an ego MC. Immediately after completing all climbing courses, perceived MC was measured through Likert responses to two statements portraying a task and ego context (i.e., "In your opinion, can we say that the purpose of this session is a private climbing lesson with the aim of progressing in that activity" for task and "In your opinion, can we can say that the purpose of this session is to rate each of the participants against each other in relation to their climbing level" for ego; Sarrazin, et al., 2002, p. 429). The manipulated MC instruction was found to be successful, with participants confirming they took on the instruction given to them prior to climbing, in support of AGT's prediction of goal choice. Overall, it was found that those in the task instructed MC successfully completed more rock-climbing courses and gave more effort than those in the ego instructed MC. Further results of involvement state will follow in the next section.

An experiment to investigate the relationship between youth football player DGO, manipulated MCs and soccer penalty kick performance was conducted (Gershgoren et al., 2011). A between group design was used, using a manipulated MC instruction, with 81 youth football players from a professional club. The manipulation of the MC was instructional feedback from their parents after the players performed penalty kicks. The task MC feedback focused on how the child could improve their own performance while the ego MC feedback emphasized the need to outperform their teammates. The investigators measured the young athlete's perceived MC as well as their "perceived parental MC." Perceived MC was measured by an altered POSQ and "perceived parental MC" was measured by asking the athletes two direct questions about their parents' expectations. Analysis found that both the participant's perception about the general MC and their more specific belief about what the MC was set by their parents significantly changed to match the standard of the parents' manipulated instruction. Specifically, when athletes were given ego feedback from their parents, participant perception about the general MC and their more specific beliefs about the MC set by their parents increased in ego while task remained the same. On the other hand, when athletes were given task feedback from their parents, their perceptions of the general MC and their specific beliefs about the MC set by their parents increased in task while also significantly decreasing in ego. This suggests that the young athletes' perception of the MC was successfully altered based on the parental feedback goal manipulation, supporting AGT predictions of goal choice. Further results of changes to achievement goal involvement state and performance will be discussed in the following sections.

Overall, when looking at the four main pillars of AGT (task DGO, ego DGO, task MC and ego MC), as simple correlations or main effects, it is ego MC that renders the most negative experiences, in line with AGT predictions that ego involvement is less advantageous than task involvement. However, what fails to be considered is the achievement goal, or ‘involvement state,’ is actually the process of the interaction of the DGOs and MC. This crucial interaction is what actually is the active state that leads to performance in the AGT model. This achievement goal involvement state and its impact on performance outcomes are discussed next.

1.4 Achievement Goal/Involvement State

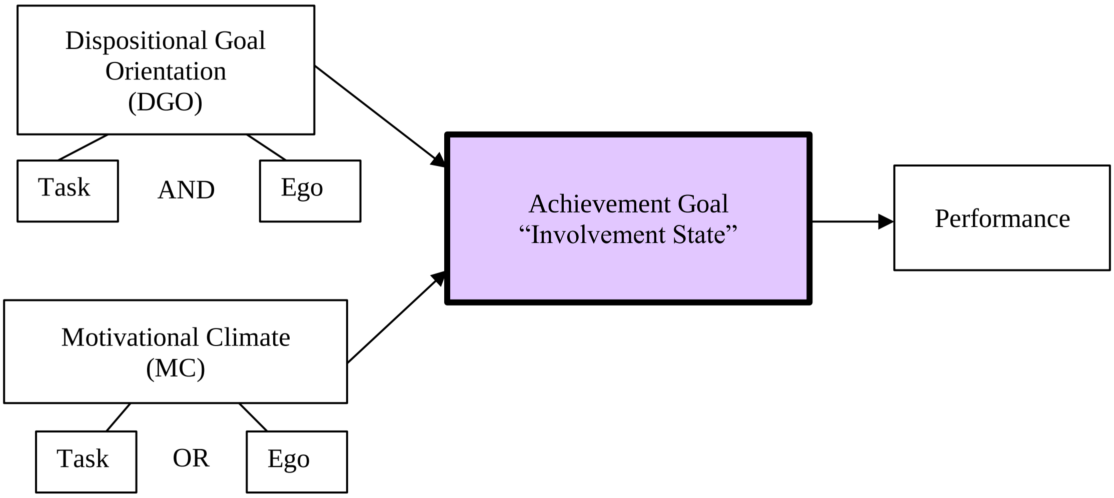

Figure 4. AGT Overview Focused on the Achievement Goal Involvement State Variable.

In the AGT framework, the achievement goal involvement state is the functioning state of setting the goal for the current achievement situation, actively influenced by and the personal DGO and the situational cues of the MC (Nicholls, 1984). This working goal setting process has been found to be a key part of the motivational process within AGT (Duda & Whitehead, 1998; Harwood, Spray & Keegan, 2008; Harwood & Thrower, 2020). It is argued that a person's achievement goal involvement state at any particular moment is difficult to directly measure because of its status as an active process that is dependent on the effects and combination of DGO and the MC situational cues (Duda & Whitehead, 1998). Achievement goals are therefore a product of both personal and situational elements that lead a person into defining and setting their goals for that achievement situation.

It is imperative to remember that AGT holds that (1) DGO and MC both contribute to shaping the achievement goal and that (2) task and ego DGO are orthogonal (Ames & Archer, 1988; Nicholls, 1984). The achievement goal shaped from the personal and situational factors motivate behaviour and affect performance (Dweck & Leggett, 1988; Nicholls, 1984). However, much AGT research in academic and sports settings (1) explore DGO and MC separately in how they affect performance and (2) regard people as either more task-oriented or ego-oriented (Buch et al., 2016; Roberts, 2012). Researchers have called for more focus on the interactions of DGO and MC in order to best predict motivational outcomes (Harwood & Swain, 1998; Lau & Nie, 2008;

Standage, Duda & Ntoumanis, 2003; Treasure et al., 1998). Simply measuring a persons' DGO or their perception of the task or ego MC will not bear full understanding to the individual's actual state of involvement. This is a premise that is sometimes incorrectly taken for granted in research into goal perspectives (Harwood & Swain, 1998). Because it is difficult to quantify or measure the goal involvement state (Duda & Whitehead, 1998), researchers have made the case that testing the interaction effect of DGO and MC is imperative to get an understanding of the process, and to better predict its effect on performance (Harwood & Swain, 1998; Lau & Nie, 2008; Standage et al., 2003; Treasure & Roberts, 1998).

Although research exists that is supportive of the interactionist approach (Lau & Nie, 2008; Maehr & Zusho, 2009), it has been reviewed that little research has actually tested these interactions empirically (Buch et al., 2016; Roberts, 2012). By systematically reviewing the present literature, it was found that research of the effects of DGO and MC on sport performance consisted of a total of 17 studies (full report can be seen in Chapter 2). All 17 of the studies included correlational analysis of the variables and 11 of them reported regression main effects of task and ego DGO and MC on the sport performance variables. However, only seven of the 17 studies tested two-way interactions of DGO x MC, only five tested the two-way interaction of task DGO x ego DGO, and only three studies tested the three-way interaction of task DGO x ego DGO x MC on sport performance variables.

It has been shown that DGO and MC have a relationship. Research has found that DGOs contribute to a congruent perceived MC (Cervelló & Santos-Rosa, 2001; Curran et al., 2015; Escartí et al, 1999; Flores, Salguero & Marquez, 2008; Newton et al., 2000; Seifriz et al., 1992; Smith et al., 2006; Theodosiou & Papaioannou, 2006). Other research has found that consistent MCs over time change a person's DGO to match (Corker et al., 2013; Button et al., 1996; Jaakkola et al., 2016; Van de Pol, Kavussanu & Ring, 2012).

A physical education study was conducted that used MC manipulations alongside measuring DGO and perceived MC (Bortoli et al., 2015). This study focused on the effect an influenced MC will have on DGO and perceived MC. It was found that the perceived MC significantly matched the induced situational MC and this perception overrode the individual's DGO (Bortoli et al., 2015). The perceived goal became more important than their DGO tendency, in line with Nicholls' (1984) intentional view of behaviour, explaining that individuals can adjust their achievement goal to the situation in order to show their competence.

The focus on task DGO and task MC as beneficial in sport settings is especially highlighted in interventions conducted to help coaches create a task-related MC to assess its impact on athlete DGO and well-being (Smoll et al., 2007). The intervention was found to be successful with the intervention group reporting a clear shift to finding their coaches and the environment as more task minded. The intervention group athletes also had a significant reduction in all areas of stress and significantly increased in task DGO while decreasing in ego DGO in comparison to the control group that did not receive the intervention. This gives evidence that deliberate manipulation of the MC is possible and can impact athlete DGO along with mental and emotional performance abilities (Smith, Smoll & Cumming, 2007).

Similar findings from other interventions set on reducing ego MC and increasing task MC are evident in the literature and supportive of the congruency of DGO and MC (Barkoukis et al., 2010; Cecchini et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls, Morley & Perry 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom et al., 1995). These interventions help coaches and physical education teachers create task MCs so that athletes and students experience more self-confidence, enjoyment, effort, satisfaction, mental toughness and less anxiety, stress, worry and negative affect. These interventions show that overtime intervention groups' perceived task MC prevail over control groups, and along with the intervention, so does enhancement of task DGO and diminishment of ego DGO. Higher ego DGO have been said to be linked to extrinsic motivations in research of sport and education (Duda, 1989; Nicholls et al., 1985; Thorkildsen, 1988), but within the research collected from the systematic literature review, ego DGO itself does not actually correlate to negative outcomes the way interventions would make it seem. Regardless, interventions focused on the psychological and mental well-being of athletes and students are productive in these regards by creating the congruency between implemented task MC and a matching/growing task DGO. They have been found to facilitate the positive mental, emotional and behavioural benefits related to this congruent relationship (Barkoukis, et al., 2010; Cecchini, et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Mclaren et al., 2015; Nicholls et al., 2016; Smith et al., 2007).

1.4.1 Congruency

Regardless of the direction of the relationship, the evidence leads to this idea of congruency between DGO and MC. This congruency approach has been discussed briefly before as a 'matching hypothesis' (Newton & Duda, 1999) or as a 'person-environment fit perspective' (Buch et al., 2016; Lau & Nie, 2008). These congruency theories hold that within AGT, a match between the individual (DGO) and the environment (MC) lend to harmony that is expressed in more goal valuation, satisfaction, reduced tension and peak performance (Buch et al., 2016; Newton & Duda, 1999).

It has been found that standard task and ego based beliefs about success are in line with this interactionist approach. Supportive of original AGT attribution predictions, the belief that success is derived from effort was found from the interaction of task DGO and task MC (Newton & Duda, 1999), while the belief that success is the outcome of ability alone was found from the interaction of ego DGO and ego MC (Treasure & Roberts, 1998).

The congruent combinations of task DGO and task MC have shown to lead to positive affect and motivation (Standage et al., 2003). However, other research has held that some people do function well in ego MCs and it is assumed that this is because they have high ego DGO scores, thus the environment matches what they as an individual value (Buch et al., 2016; Kuczek, 2013; Roberts, 2012). From the systematic literature review reported in Chapter 2, two studies (Abrahamsen et al., 2008b; Buch et al., 2016) found significant two-way interactions of ego DGO and ego MC. It was alluded that this combination was significant in predicting perceptions of ability (Abrahamsen et al., 2008b) and treadmill run performance (Buch et al., 2016).

In the limited evidence of congruent and incongruent two-way interactions, it even seems that incongruent two-way interactions offer support for the 'matching hypothesis.' The incongruence between a high task DGO and perceived low task MC led to less motivation and negative affect (Standage et al., 2003). The negative implications of an incongruent relationship also imply the advantages of harmony and investment in congruent relationships that can affect performance. From the systematic literature review, Bortoli et al. (2009) found significant interactions between ego DGO and task MC and between task DGO and ego MC. Similarly, Kim et al. (2011) also found a significant interaction between task DGO and ego MC. It was found that ego DGO positively predicted pleasant affect when task MC was low (Bortoli et al., 2009). For the interactions between task DGO and ego MC, task DGO positively predicted approach coping (Kim et al., 2011) and pleasant affect (Bortoli et al., 2009) when ego MC was low. These mismatches betweenDGO and MC (ego DGO with task MC, and task DGO with ego MC) support predictions of positive mental and emotional variables when one is high and the other is low. This also is in line with the idea of congruency creating valuable achievement goals that fare well for athletes mental and emotional performance.

This congruency between DGO and MC becomes more complicated when the whole DGO profile is taken into account, as each person has levels of both task and ego DGO. Harwood and Swain (1998) used an interactionist method and analysis to view the moderation effect of DGO and MC variables on a competitive setting but did not find any interaction effects. The absence of a two-way DGO x MC interaction showed a lack of consistency with the congruency notion. The inconsistent findings of the two-way congruent interactions of DGO and MC have, however, led to the belief that these roles may be contingent on the whole DGO profile (Darnon et al., 2010; Harwood & Swain, 1998; Standage, et al., 2003).

The whole DGO profile of a person can range from low to high of each task and ego DGO (high in both, low in both, or high in one and low in the other) (Pensgaard & Roberts, 2002; Van de Pol et al., 2012). The interaction of ego DGO and task DGO can predict motivational outcomes as it is the whole profile of a person (Standage et al., 2003; van de Pol et al., 2012). It is possible then that the congruent moderating role of one DGO on MC is contingent on the level of the other goal DGO (Darnon, et al, 2010; Harwood & Swain, 1998; Standage et al., 2003). It is theorized that when a person has a high/low DGO profile (high task DGO/low ego DGO or high ego DGO/low task DGO), there will be a significant performance advantage when the MC matches their high DGO (Buch et al., 2016; Darnon et al., 2010).

But the combination of high task DGO and high ego DGO is considered the most motivated type of profile (Pensgaard & Roberts, 2002). Although Pensgaard and Roberts (2002) found that athletes with a high task DGO/high ego DGO profile had better experiences and affect from task MCs, it is also argued that people who are high ego/high task DGO will actually be in a congruent relationship with their MC no matter if it is a task or ego MC (Darnon et al., 2010). In this way, even though the congruency from the high/low fit will not be as clear, these profile types will still be highly motivated in either MC.

From the rock-climbing experiment discussed in the last section, Sarrazin et al. (2002) wanted to measure participants most likely to adopt either the task or ego MC as their achievement goal involvement state using the high/low DGO with matching MC concept. Using the POSQ to measure DGO of a sample of 500 boys, experimenters only retained the 78 boys who scored high in one DGO (in top third of distribution) and low in the other DGO (in bottom third of distribution) and put them in the MC condition corresponding to their high DGO. Thus, the high task/low ego DGO participants were put in the task MC condition and referred to as those in task-involvement (N = 38). The high ego/low task DGO participants were in the ego MC condition and referred to as those in ego-involvement (N = 40). Overall, it was found that task-involvement had better results than ego-involvement. These objective performance results will be further discussed in the next section.

Instead of putting participants into MCs that would likely elicit the desired involvement state, the penalty-kick experiment conducted by Gershgoren et al. (2011) randomly put participants in either the task or ego MC manipulated climate of parental feedback and then attempted to measure their involvement state by two direct questions after the penalty kicks. Task and ego DGOs were measured with the TEOSQ. Regarding the involvement state specifically, the effect of parental feedback manipulation on the athlete's goal involvement state was significant. Those given ego parental feedback after the first round of penalty kicks significantly increased their ego goal involvement performance in the next round of kicks while their task involvement stayed the same. Those given task feedback by their parents between rounds of penalty kicks had a significant increase in task goal involvement performance and a significant decrease in ego involvement. There was no change in DGO by the athletes after the manipulated MC, indicating that their DGO was actually a stable disposition. Performance findings will be discussed following this section.

From the systematic literature review, of the three studies that tested the three-way interaction of task DGO x ego DGO x MC (Buch et al., 2016; Kim et al., 2011; Magyar & Feltz, 2003), two studies found significant interactions. In alignment with Pensgaard and Roberts (2002), Kim et al. (2011) found that when participants who were high in both task and ego DGO had a high perceived task MC, they had increased levels of perceived controllability in their sporting situation. In line with the congruency of the MC matching the high levels of DGO in a high/low DGO relationship (Darnon et al., 2010), Buch et al. (2016) found a significant advantage for high ego/low task DGO in a perceived ego MC along with a significant advantage for high task/low ego DGO in a perceived task MC. These changes in achievement goal involvement states and interactions supported the congruency effect, being stronger in the high/low DGO profiles matching the MC to whichever DGO is high. These significant findings will be further discussed in the following section regarding how these interactions actually impact objective performance.

1.5 Effects of AGT on Objective Performance

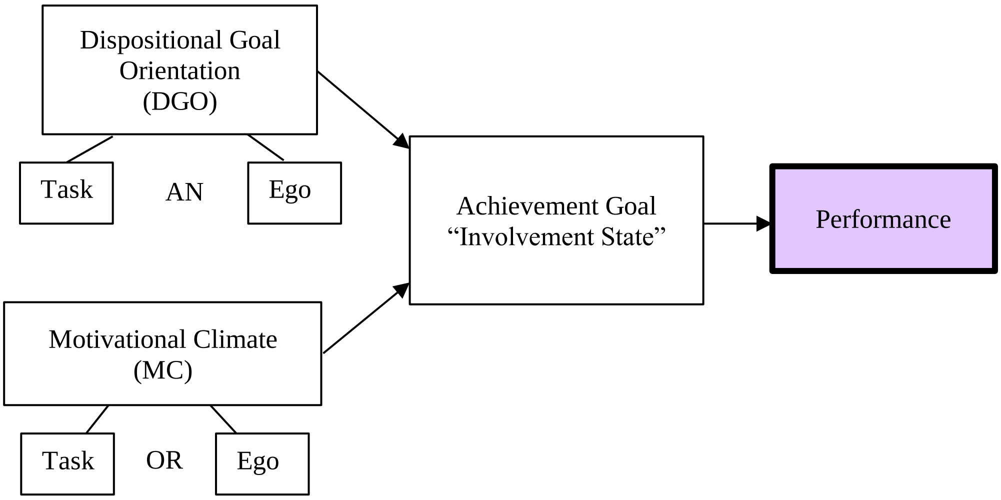

Figure 5. AGT Overview Focused on the Performance Variable.

AGT research, particularly in the domain of sport, has relied heavily on subjective and self-report data (Smith, Quested, Appleton & Duda, 2016). This is helpful for all of the evidence AGT research has found in regard to athlete psychological, emotional and social states across task and ego DGOs and MCs. However, when it comes to how the components of AGT affect objective sports performance, there is a lack of experimental studies and data. There is a large amount of evidence regarding how task and ego DGOs and MCs correlate to subjective variables associated with sport performance such as confidence, coping strategies and satisfaction (Duda, 2005; Harwood et al., 2015; Reinboth & Duda, 2016). However, the premise of AGT is that DGOs and MCs interact to create the active achievement goal involvement state (Nicholls, 1984). It is this interaction that is theorized to affect sport performance. In general, the research in sport AGT has been correlational, missing these vital interactions of DGOs and MCs. Research has even largely missed the objectivity of sport performance as a dependent variable in these interactions. The very distinction between the task and ego conceptions of ability is the reference of success to either the self (task) or to others (ego) (Nicholls, 1984). This idea of the distinction between task and ego value being either derived from within a person or against others calls for sport performance to be measured objectively. The innate foundations of overt competition in sport have even been highlighted in comparison to the educational domain in order that researchers are aware of the explicit competitive nature of sport (Duda & Nicholls, 1992). In between education and sport lies physical education. The following information is a review of objective performance in physical education followed by a review of actual performance in competitive sport settings.

A review of correlates of MC and involvement states in physical activity and physical education (Harwood, Keegan, Smith & Raine, 2015) summarized that ego MCs were associated with amotivation, negative affect and maladaptive strategy use. On the other hand, they found that task MCs consistently and positively are associated with a variety of adaptive mental, emotional and even actual behavioral performance variables. The objective performance outcomes positively related to task MCs were cardiovascular fitness (Brown & Fry, 2013; Wang, Lui, Chatzisarantis & Lin, 2010), 1-mile run (Xiang, Bruene & McBride, 2004), win/loss percentage (Cumming, Smoll, Smith & Grossbard, 2007) and teacher assessment of skill level (Yoo, 1999). However, on closer examination of these "objective" performance variables, cardiovascular fitness was measured by questionnaires about goals, enjoyment and commitment to intended exercise (Brown & Fry, 2013; Wang, et al., 2010). The study examining teacher evaluation of student skill level indicated "objective and comparable measures of the participants' sport performance were virtually impossible…the instructors therefore assessed subjective performance" (Yoo, 1999, p. 266). The win/loss percentage of basketball teams was an objective measure of sport performance but correlated individual athletes' MC perceptions to their team's overall record, noting that sport team investigations violate individual data and observations (Cumming, et al., 2007). Lastly, the 1-mile run was a true measure of objective run performance of 9-10-year old's through a timed 1-mile during their physical education class (Xiang, et al., 2004). Although the classification of "objective performance" variables is a rather loose grouping, the overall review did find that a perceived task MC had a small positive association to "objective performance" among other positive mental and emotional variables, while an ego MC showed no relationship (Harwood, et al., 2014), in line with the findings of the systematic literature review for objective performance, which will be discussed next.

This final section will discuss the results from the few studies that have tested DGO and MC interaction effects on objective sport performance. In the penalty kick experiment (Gershgoren et al., 2011), performance was measured by two sets of shots made out of five penalty kicks. Athletes first filled out the TEOSQ and altered POSQ to measure DGO and perceived MC, then shot their first set of penalty kicks, and then answered the questions about their achievement goal involvement state. They then received the MC manipulation which consisted of parental feedback, half giving ego instruction and half giving task instruction to their children. The athletes then refilled out the TEOSQ and altered POSQ questionnaires and did another round of penalty kicks, followed by the questions regarding their goal involvement state. This was to test if the manipulation of the MC affected athletes' DGO, perceived MC and performance.

Even though it was found that the manipulated MC feedback changed the athletes' perceived MC and achievement goal involvement state, it did not actually affect the players' DGO or their penalty kick performance. Mixed ANOVA data also showed non-significant main and interaction effects for the manipulated task or ego MC and the objective measures of performance by penalty kicks scored, thus not showing a difference in objective performance. A potential issue with this objective performance variable is the confounding variable of a goalkeeper either stopping the kick or not, which could have significantly altered any effect the manipulated MC or goal involvement state would have had on the individual's performance if they were in sole control of their performance. A second possible issue is the adversarial nature of a penalty kick against the goalkeeper, thus promoting an ego MC regardless of the ego and task MC manipulation. However, it has also been found that penalty kicks are taught, practiced and performed as either power or placement kicks (Timmis et al., 2014). With power kicks being ego-involved focused on powering the ball through the goalkeeper and placement kicks being task-involved focused on placing the ball in one of the four corners regardless of what the goalkeeper does. In this way, the manipulation of task or ego MC would still be possible.

In the rock-climbing experiment (Sarrazin et al., 2002) that put participants in the manipulated MC that was congruent to their high/low DGO profile, two objective performance measures were used. First, the rock-climbing consisted of 5 separate courses, normatively established as very easy, easy, moderate, difficult and very difficult. All boys across conditions had unlimited attempts and time to complete each course. Performance was defined solely as the completion of each climb, regardless of how many times it took or how quickly it was done. The second objective performance variable was effort measured using heart rate reserve percentage, a formula incorporating maximal and resting heart rates in order to account for different levels of fitness and age.

For performance results, a chi-square test showed the distribution of success or failure of the rock-climbing courses as a function of the achievement goal involvement, finding that task-involved participants had more success than those who were ego-involved. The final set of results showed the level of effort measured during each of the climbs. A main effect of MC involvement showed that task-involved boys gave more effort during the climbs than the ego-involved boys, regardless of perceived ability or course difficulty.

It should be highlighted that both the task involvement group and the ego involvement group were congruent interactions of high/low DGO profiles matching the MC, which are expected to both perform well in these interactions. But, when compared to each other, the task-involved group outperformed the ego-involved group. A caveat with the objective performance element is that it did measure persistence perhaps instead of climbing performance. With unlimited time and attempts to complete each course to be counted as successful, it focused on the ones who stayed at it longer, while not reporting anything about the timed trials the high ego/low task DGO boys would have been focused on. Despite this critique, these findings are consistent with the prediction drawn from AGT that task involvement's focus on effort allows for better performance (Nicholls, 1984).

In line with the congruency element of the MC matching the high levels of DGO in a high/low DGO relationship, from the systematic literature review, Buch et al. (2016) found in their treadmill experiment that a perceived ego MC predicted positive running performance when moderated by a person with high ego DGO and low task DGO. Similarly, it was found a perceived task MC predicted positive running performance in participants with high task DGO and low ego DGO. Unlike the rock-climbing experiment, they did not compare the groups head to head. Nevertheless, it was found that the congruency effect is stronger for objective running performance when a person has a high/low DGO profile and are in the MC of the DGO they are high in. Lastly from the systematic literature review, in line with the main effect evidence thus far dealing with objective sport performance, ego MC had no relation to VO_{2max} treadmill run (Buch et al., 2016) or to player or coach performance assessment (Cervelló et al., 2007) while task MC positively related to VO_{2max} performance (Buch et al., 2016) and player self-assessment of performance (Cervelló et al., 2007).

1.6 AGT Summary & Overview

As previously introduced, DGOs are the innate tendency for people to resort to their preference for either task related behaviours or ego related behaviours in achievement settings. However, situational factors, or the MCs, can also influence the choice of task or ego involvement to achieve the given goal. It is predicted that ego MCs are the outcome of any competitive instruction, public view, or measure of a valued skill or commonly ranked performance measure such as a test. Task MCs are elicited by non-competitive conditions and neutral instructions. Together, the DGOs and MCs interact to create the active achievement goal involvement state.

A common thread in AGT work is the favouring of task DGO and MC over ego DGO and MC. It has been reported and argued that task DGO allows for more positive and adaptive patterns of behaviour, emotion and motivation than ego DGO allows for (Duda, 2001). In a systematic review by Harwood, Keegan, Smith and Raine (2015), it was reported that a task MC also accounted for higher self-competence scores, along with a small relation with objective performance. Within training sessions, studies have found that sessions with a task MC focus tend to lead to higher levels of psychological well-being compared to training session with a competitive ego MC which tend to lead to higher levels of anxiety and overall reduced satisfaction (Balaguer, et al., 1992; Duda, 2001; Pensgaard & Roberts, 2000; Vazou, et al., 2006). A task MC in general leads to overall psychological well-being and enjoyment due to the focus on effort, learning and getting better while an ego MC creates performance anxiety due to the focus on winning, ability over effort and punishment for mistakes (Atkins, et al., 2015; Balaguer, et al., 1999; 2002; Duda, 2001; Newton et al., 2000; Pensgaard & Roberts, 2000).

Across the two-way and three-way interaction findings between task DGO, ego DGOand MC, support is offered for the implicit prediction that congruency is more motivational and leads to better sport performance. Even with ego DGOs and ego MCs, positive effects are found when in a matching relationship, going against the original AGT predictions that task is preferable to ego. Crucial evidence of this is found in Buch et al. (2016) which found that for running performance the congruent ego interaction was positive. However, this goes against all the intervention studies that seek to diminish ego involvement in sport. As discussed before, objective sport performance variables are not well represented in the literature, particularly in studies that also measure the interaction effect of DGO and MC. With a lack of experimental studies that incorporate interaction terms and objective performance variables, achievement goal theory cannot be fully captured in sport research.

The following chapter (Chapter 2) is the detailed report of the systematic literature review that was conducted for this thesis based on the main components of AGT including DGO, MC and sport-based performance variables. Although the findings from the systematic literature review have been discussed throughout the current introductory chapter (Chapter 1), the following chapter displays the process and evidence in an orderly way. The findings are reported based on the sport-based performance variables in three categories: mental performance factors, emotional performance factors and behavioural performance factors. Within the mental performance factor section, correlations and regressions are reported involving task and ego DGOs, MCs and perceived competence and confidence. Within the emotional performance factor section, correlations and regressions are reported involving task and ego DGOs, MCs and psychobiosocial states, competitive anxiety/psychological difficulties and coping strategies/controllability. Within the behavioural performance factor section, correlations and regressions are reported involving task and ego DGOs, MCs and performance improvement, performance satisfaction and performance evaluation.

Following the systematic literature review in Chapter 2, three experiments are reported in Chapters 3-5, that will address some of the current gaps in literature identified in this introduction. These experiments used a mixed design to test the effects and interactions of the categorical within-subject IV of manipulating the MC with instructions (task MC and ego MC) and the continuous between-subject independent variables of DGOs (task and ego) on the dependent variables. The first two studies used an exertion-based running outcome variable, first with Study 1 using a sample of elite level athletes (Chapter 3), and then Study 2 with a sample of recreational athletes (Chapter 4) in order to test generalizability across ability levels. The third experiment, Study 3 (Chapter 5), then used a skill-based basketball shooting technical outcome variable in order to test generalizability across objective performance types from exertion-based to skill-based in sport settings. As the following systematic review chapter will highlight, current sport literature is based on experiments that tend to be between groups, based on youth and recreational athletes and almost no measures of objective performance. Chapter 6 will then discuss and conclude how the experimentally manipulated findings from this thesis address just how task and ego DGOs and MCs contribute to objective sports performance in ways contrary to what has been thus far. The main findings include ego DGO and MC having negative effects on skill-based performance and confidence but positive effects on exertion-based performance. Particularly interesting, an interaction of full DGO profiles of athletes within ego MC favour the majority of athletes in exertion-based performance as well. A discussion of the possible explanations, implications for coaches and athletes and limitations of the research will then conclude the chapter.

Chapter 2:

A Systematic Literature Review of the Relationship between DGO, MC, and Sport Performance Variables

This report used the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P; Moher et al., 2015), a 17-item checklist, as a guideline to facilitate in the procedural preparation and reporting of relevant data (item 1a) for this novel systematic review (item 1b). As this systematic review was conducted as part of a PhD by thesis, administrative information from the PRISMA-P checklist was not incorporated including registration (item 2), contributions and guarantors (item 3), amendment plans (item 4), sources of financial support and sponsor information (items 5).

2.1 Introduction

2.1.1 Rationale and Objectives (items 6 and 7)

This systematic literature review is based on the main components of AGT discussed in the preceding chapter including DGO, MC and sport-based performance variables. There are many types or variations of achievement goal theories (Ames, 1984; Dweck, 1986; Elliot, 1999; Elliot & Church, 1997; Maehr, 1974; Maehr & Nicholls, 1980; Nicholls, 1984; 1989), but this specific review, like the thesis in general, is focused on the Nicholls (1984) version. AGT is an interactionist theory, rooted in the belief that innate conceptions of ability, perceptions of the environment and the motivation to set certain goals predict achievement behaviour.

The objective of this systematic literature review is to report on studies that have examined the correlations and main effects of the independent variables DGOs (task and ego) and MCs (task and ego), and/or their interactions, on the dependent variables of sport performance variables.

Athlete performance contains elements of perceptual, cognitive and strategic aspects of behaviour (Eklund & Tenenbaum, 2014) while maximum sport performance has been defined as the combination of “psychological, cognitive, emotional, behavioural and psychophysiological” factors (Portenga, Aoyagi & Cohen, 2016, p. 6). For these reasons, the systematic review included studies that used direct, objective measures of performance, such as treadmill run VO_{2max} performance as well as studies that used subjective measures of performance such as self-confidence and coping techniques while playing.

2.2 Methods

2.2.1 Eligibility/Inclusion Criteria (item 8)

Report characteristics used as criteria for eligibility for the review included published peer-reviewed from year 1990-2020 in English language and reported primary data.

Study characteristics used as criteria for eligibility included measurement of task and ego DGOs, manipulation or measurement of task and ego MC along with at least one performance dependent variable. Studies are included which have used either the TEOSQ (Duda, 1989) or POSQ (Roberts & Balagué, 1989; Roberts, Treasure & Balagué, 1998) to measure task and ego DGOs because they were derived from the work of Nicholls and colleagues when founding AGT (1985).

Task and ego DGOs, as described in research into academic attainment, were found to generalize to the sport domain in initial sport research conducted in the 1980's (Duda, 1986; Ewing, 1981; Gill, 1986). Evidence of the two orthogonal DGOs has since been demonstrated in the sport domain primarily based on the Task and Ego in Sport Questionnaire (TEOSQ; Duda, 1989) and the Perception of Success Questionnaire (POSQ) (Roberts & Balague, 1989; 1991). These questionnaires were created based on the work of Nicholls (1984; 1989) in order to determine athlete task and ego DGO in sport settings and allowed sport research to assess how the DGOs relate to sport beliefs, behaviour and performance.

The TEOSQ (Duda, 1989), is a sport-specific modification of the inventory that Nicholls (1989) developed to assess task and ego DGO in the academic field. Duda (1989) made a footnote that "this sport-specific measure of task and ego DGO was developed by J. Nicholls and the author for use in a collaborative project that is in progress" (p. 335). Duda (1989) sought to show validity and reliability of the TEOSQ and replicate the study of Nicholls and colleagues (1985) that examined the relationship between task and ego DGO and views of the purpose of the education, but with athletes in a sport context. The sample consisted of 128 male and 193 female high school varsity athletes, all of whom were white and of middle-class backgrounds. Participants' task and ego DGO in sport was measured using the TEOSQ and their beliefs of the purpose of sport was measured using the Purpose of Sport Questionnaire (Duda, 1989), an adaptation of the Purposes of Schooling Questionnaire used by Nicholls et al. (1985). In congruence with academic findings, a relationship was found between athlete DGO and the perceived values and benefits of sport. Particularly, athletes high in task DGO believed sport served to teach the value of trying one's best, cooperation with others, following rules, mastery and good sportsmanship. Conversely, athletes high in ego DGO were found to believe that sport participation should lead to extrinsic rewards such as increasing social status, outdoing other competitors, and a better chance at getting into college, acquiring a good job and making money.

Since Duda's (1989) study, the TEOSQ has been found to affirm the dispositional goals found in research into academic achievement and continues to be one of the primary measures of task and ego DGO in sport (Duda, Chi, Newton, Walling, & Catley, 1995). The reliability and validity of the TEOSQ has been expanded on by Duda and Whitehead (1998) who were able to conclude the test is useful and appropriate in deciphering motivation DGO in athletes. Sport research using the TEOSQ has also been able to establish DGO profiles across age and competitive levels. Research has expanded to include youth elite and grassroots athletes (Koumpoula et al., 2011; Smith, Balaguer, & Duda, 2006; Van-Yperen & Duda, 1999), adolescent and high school athletes (Duda et al., 1991; Givvin, 2001), and elite and non-elite university students (Duda & White, 1992; Gimeno & García-mas, 2010; Kuan & Roy, 2007).

The POSQ was also based on Nicholls et al. (1985) academic work and developed specifically for sport like the TEOSQ. However, unlike the TEOSQ, the authors did not want to modify the pre-existing inventory used by Nicholls and colleagues. Instead, they opted to create their sport DGO questionnaire based on a number of sources in both the academic and sport contexts and a panel of experts (Roberts & Balague, 1989). The scale was refined and reduced in size to a 12-item questionnaire and correlated with the TEOSQ, in which it was found the POSQ's psychometric properties were strong (Roberts, Treasure & Balague, 1998). The use of the POSQ to measure sport DGO found similar findings as the DGO scale in research into academic performance and the TEOSQ. In the first study using the POSQ, Treasure and Roberts (1994) found that athletes with high task DGO believed success was a result of effort and satisfaction was obtained from mastery experiences. In contrast, athletes with high ego DGO believed success resulted from ability and external factors and satisfaction was derived from being better than others.

The POSQ has also demonstrated the orthogonal nature of task and ego achievement DGOs that were first found in classroom settings (Nicholls, 1989). The POSQ task and ego DGO internal reliabilities were also found to be high along with strong construct validity and concurrent validity. Through evidence from confirmatory factor analyses on both the children and adult version, the POSQ was deemed reliable and valid across ages in measuring DGOs in sport and has been used in a variety of levels of sport (Buch, Nerstad, Aandstad & Säfvenbom, 2016; Cervelló, Rosa, Calvo, Jiménez & Iglesias, 2007; Murcia et al., 2008; Roberts, Treasure & Balague, 1998; Ryska et al., 1999; Van de Pol & Kavussanu, 2011; Van de Pol, Kavussanu & Ring, 2012).

For the current research, it was decided to use the TEOSQ for the experimental studies in Chapters 3-5 since it was created by Duda and Nicholls (1989) and derived from Nicholls' (1984) original AGT. The POSQ deviated from the original inventory, but still shows reliability and validity to be a useful measure of task and ego DGO. For these reasons studies which used either the TEOSQ or POSQ were included in this systematic literature review. For MC, studies were considered with either manipulated MC in an experimental design or measured perceived MC.

Exploratory factor analyses found the PMCSQ to be valid and reliable (Seifriz et al., 1992) and further internal reliability and construct validity via confirmatory factor analysis was also found to be acceptable (Fry et al., 1993; Walling, Duda & Chi, 1993). The PMCSQ-2 later added more subscales of the task and ego MCs and was also found to fit the hypothetical model and be both valid and reliable (Newton, Duda & Yin, 2000; Zurita Ortega et al., 2018).

For sport performance, multiple elements have been considered. Eklund and Tenenbaum (2014) explain athlete performance as elements of perceptual, cognitive and strategic aspects of behaviour while Portenga et al. (2016) have incorporated performance psychology to broaden their study of sport performance on "psychological, cognitive, emotional, behavioral and psychophysiological inhibitors of consistent, excellent performance" (p. 6). With these definitions of athlete performance and of performance psychology, the mental, emotional and physical skills and abilities will be addressed as factors that influence optimal performance.

Excluded dependent variables included variables associated with mental health disorders in athletes such as eating disorders, doping, depression, media induced stress and cheating, for they are more associated with sport psychiatry and rehabilitation of athletes beyond successful optimization of sport performance (Ströhle, 2019). This review is focused solely on the relationship of task and ego DGO, task and ego MC and sport performance.

2.2.2 Information Sources (item 9)

All intended information sources were from electronic databases, available through Durham University. Databases included PsychArticles, PsychInfo and Web of Science.

2.2.3 Search Strategy (item 10)

The search strategy used in all databases is as follow: "goal orientation" [AND] "motivation* climate" [OR] "motivation* environment" [OR] "psychological environment" [OR] "psychological climate" [OR] "coaching environment" [OR] "coaching climate" [AND] "performance" [OR] "effort" [OR] "ability" [OR] "competence' [OR] "confidence" [OR] "achievement" [OR] "accomplishment" [OR] "attainment" [OR] "endurance" [OR] "agility" [AND] "sport" [OR] "athlete*" [OR] "exercise" [OR] "fitness."

2.2.4 Study Records (item 11)

2.2.4.1 Data Management (item 11a). Endnote was used as the mechanism to manage records throughout the review.

2.2.4.2 Selection Process (item 11b). Initial screening was an abstract and keyword screening. Every abstract and keyword list was read from all papers found using the search strategy from Section 2.2.3. If DGO, MC and/or a sport performance variable was included the full text was pulled to see if all three variables were included (DGO, MC and performance variables). All pulled full texts were then screened and included for review if the study used the TEOSQ or POSQ to measure task and ego DGO, and either manipulated the MC using a task and ego instruction or measured the perceived MC, and if the performance related variable was any physical, emotional or mental aspect of sport performance.

2.2.4.3 Data Collection Process (item 11c). A total of 392 results were found through the search process. Two results from PsychArticles, 94 results from PsychInfo and 296 results from Web of Science. The data collection and selection process are shown in the following Figure 6 flow chart.

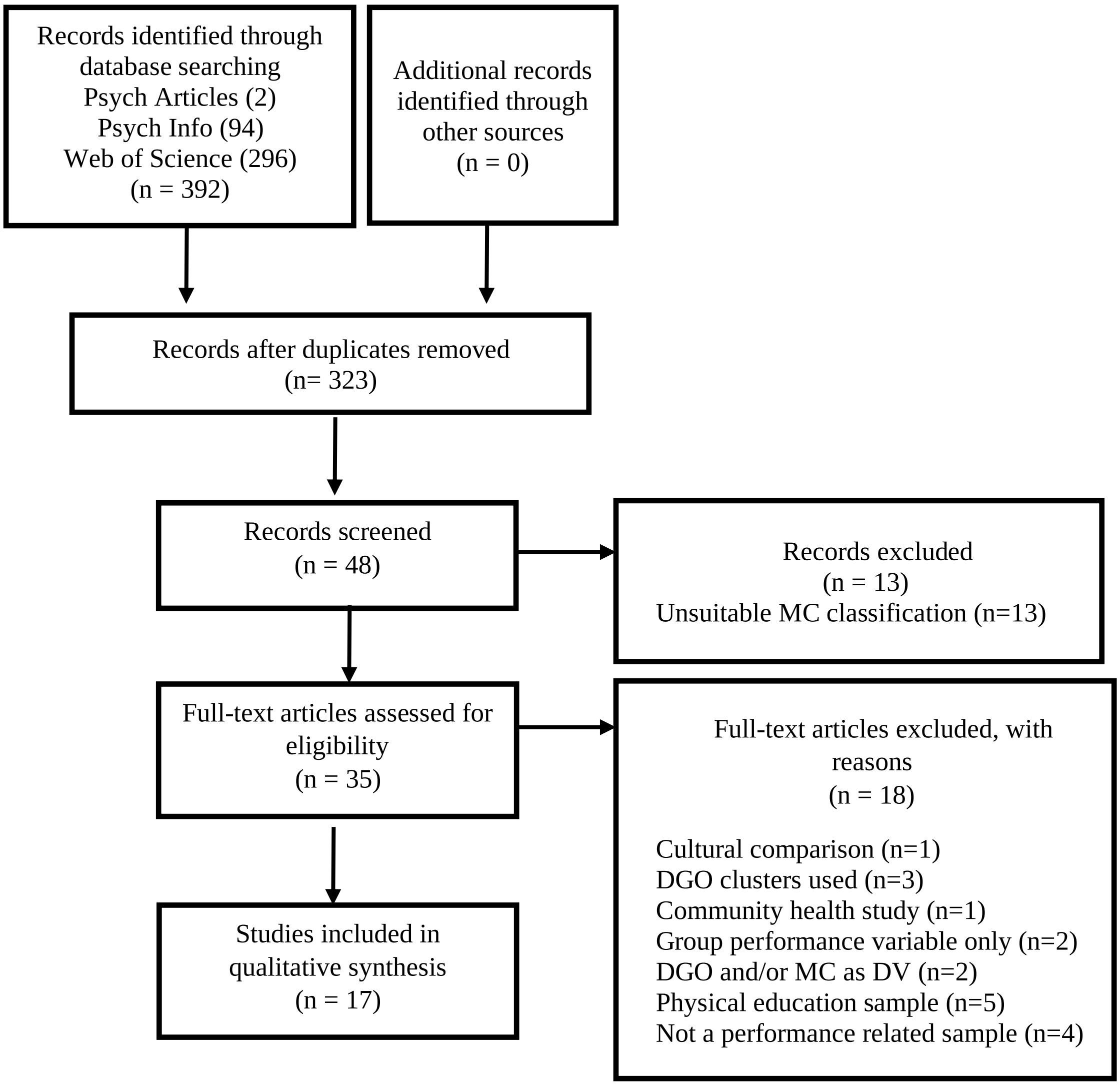

Figure 6. Data Collection Process Flow Chart.

2.2.5 Risk of Bias in Individual Studies (item 14)

Risk of bias normally applies to randomised trials, and with no recognised checklists for correlational studies, this review defers to three criteria used in a systematic review with meta-analysis of correlational studies by Hoffmann and colleagues (2017). The first criterion is that sample size was sufficiently large enough for the hypothesized effects. This could be done via power analysis. Since the correlation coefficient 0.3 has been deemed as a medium effect size (Cohen, 1992), using G*Power a priori test for correlations, with power of .80, it was determined a sample requirement of 84 is necessary in order to achieve the 0.3 correlation coefficient. The second criterion is that the sample is representative of the target population. The third criterion is that the studies use valid and reliable measures, assessed previously by validated and/or tested measures and report sufficient internal scale reliability ($\alpha > 0.6$).

To rate the quality of each study the criteria scoring system was also used from the original study (Hoffmann, et al. 2017). Each of the three criteria is worth 1 point. A 0 was given if the criteria was not, by being absent, unclear or not reported adequately. For criterion 1 and 2, the study gets either 0 or 1 point for meeting the requirement (1 point) or not (0 points). For criterion 3, when studies used more than measure, each measure was considered for validity, reliability as well as reporting of the adequate internal scale reliability Cronbach alpha scores, which all contributed to a single ratio. This means studies could score between 0 and 1 point if some measures met the requirement, but others did not. Single-item measures were deemed not applicable for reliability assessment, and not included in the score (Hoffman et al., 2017). Once all criteria were given a score, a total was summed across all 3 criteria to give each study an overall score of risk of bias. Studies were deemed high quality if they achieved an overall score greater than 2, medium quality if they achieved an overall score between 1-2, and low quality if they achieved an overall score less than 1. See Table 1 for an overview of the scoring and totals. Studies of low quality were not omitted from the review, but this criteria-based scoring system was used to highlight areas of potential bias.

Table 1. Overview of risk of bias scoring and totals of all review studies.

Study	**Criteria 1:** Sample size sufficiently large	**Criteria 2:** Sample representative	**Criteria 3**: Reliable/valid measures & internal reliability	**Point total & Quality classification**
Achievement goals and gender effects on multidimensional anxiety in national elite sport (Abrahamsen et al., 2008a)	1.00	1.00	1.00	3.00 High quality
Perceived ability and social support as mediators of achievement motivation and performance anxiety (Abrahamsen et al., 2008b)	By gender: 0.00 Combined: 1.00	1.00	1.00	By gender: 2.00 Medium quality Combined:3.00 High quality
Situational and dispositional goals as predictors of perceptions of individual and team improvement, satisfaction and coach ratings among elite female handball teams (Balaguer et al., 2002)	1.00	1.00	0.50	2.50 High quality
Motivational climate and goal orientations as predictors of improvement, satisfaction and coach ratings among tennis players (Balaguer et al., 1999)	1.00	1.00	0.25	2.25 High quality
Competence, achievement goals, motivational climate, and pleasant psychobiosocial states in youth sport (Bortoli, et al., 2011)	1.00	1.00	0.60	2.60 High quality
Dispositional goal orientations, motivational climate, and psychobiosocial states in youth sport (Bortoli et al., 2009)	1.00	1.00	0.83	2.83 High quality
Contextual and individual influences on antisocial behaviour and psychobiosocial states of youth soccer players (Bortoli et al., 2012)	1.00	1.00	0.80	2.80 High quality
Exploring the interplay between the motivational climate and goal orientation in predicting maximal oxygen uptake (Buch et al., 2016)	1.00	1.00	0.71	High quality 2.71
Young tennis players' competitive task involvement and performance: The role of goal orientations, contextual motivational climate, and coach-initiated motivational climate (Cervelló et al., 2007)	1.00	1.00	0.88	2.88 High quality
Female adolescent soccer players' perceived motivational climate, goal orientations, and mindful engagement (Iwasaki & Fry, 2016)	1.00	1.00	0.50	2.50 High quality
Predicting occurrence of and responses to psychological difficulties: The interplay between achievement goals, perceived ability, and motivational climates among Korean athletes (Kim et al., 2011)	1.00	1.00	0.75	2.75 High quality
Achievement involvement and stress coping in elite wrestling (Kristiansen et al., 2008)	0.00	1.00	1.00	2.00 Medium quality
Predictors of sources of self-confidence in collegiate athletes (Machida et al., 2012)	1.00	1.00	1.00	3.00 High quality
The influence of dispositional and situational tendencies on adolescent girls' sport confidence sources (Magyar & Feltz, 2003)	1.00	1.00	1.00	3.00 High quality
The relationship between competitive anxiety, achievement goals, and motivational climates (Ntoumanis & Biddle, 1998)	1.00	1.00	1.00	3.00 High quality
The mediating role of coping strategies on the relationship between achievement motivation and affect in sport (Ntoumanis et al., 1999)	1.00	1.00	0.50	2.50 High quality
The dynamics of motivation and perceptions of control when competing in the Olympic Games (Pensgaard, 1999)	0.00	1.00	0.50	1.50 Medium quality

2.2.6 Data Synthesis (item 15)

The planned summary measures of all included sample size, participants age, gender, level of athlete experience, sport and location, as summarized in Table 2. DGO measurements, MC manipulation or measurements, and performance measurements are discussed in the next section.

Table 2. Systematic Literature Review Summary of Samples.

Study	Age Group *M* years (±*SD*)	Total *N* Gender *N*	Level/years experienced	**Team or Individual Sport Type**: Sports Included	Location
Achievement goals and gender effects on multidimensional anxiety in national elite sport (Abrahamsen et al., 2008a)	Youth – adult 17.8 (±*5.7*)	*N* = 190 89 female 101 male	Elite	**Individual:** athletics, badminton, golf, orienteering, swimming, tennis	Norway
Perceived ability and social support as mediators of achievement motivation and performance anxiety (Abrahamsen et al., 2008b)	– Ages not reported	*N* = 143 69 female 74 male	Elite	**Team:** handball	Norway
Situational and dispositional goals as predictors of perceptions of individual and team improvement, satisfaction and coach ratings among elite female handball teams (Balaguer et al., 2002)	Adolescent – adult 21.75 (±*3.7*)	*N* =181 All female	Elite	**Team:** handball	Spain
Motivational climate and goal orientations as predictors of improvement, satisfaction and coach ratings among tennis players (Balaguer et al., 1999)	Adolescent 15.6 (±*2.1*)	*N* = 189 73 female 116 male	Intermediate, advanced & professional	**Individual:** tennis	Spain
Competence, achievement goals, motivational climate, and pleasant psychobiosocial states in youth sport (Bortoli, et al., 2011)	Youth 13.4 (±*0.5*)	*N* = 320 160 female 160 male	2-5 yrs exp	**Team:** basketball, soccer, water polo, volleyball **Individual:** track & field, gymnastics, martial arts, swimming, skating, tennis	Italy
Dispositional goal orientations, motivational climate, and psychobiosocial states in youth sport (Bortoli et al., 2009)	Youth 13.4 (±*0.5*)	*N* = 473 217 female 256 male	2-5 yrs exp	**Team:** basketball, soccer, volleyball, rugby **Individual:** track & field, gymnastics, martial arts, swimming, tennis	Italy
Contextual and individual influences on antisocial behaviour and psychobiosocial states of youth soccer players (Bortoli et al., 2012)	Youth 14.9 (±*0.8*)	*N* = 388 All male	Club avg 7 yrs exp	**Team:** soccer	Italy
Exploring the interplay between the motivational climate and goal orientation in predicting maximal oxygen uptake (Buch et al., 2016)	Adult 23.6 (±*2.63*)	*N* = 123 13 female 110 male	Academy	**Team:** military	Norway

Young tennis players' competitive task involvement and performance: The role of goal orientations, contextual motivational climate, and coach-initiated motivational climate (Cervelló et al., 2007)	Youth 13.7 (±*1.8*)	*N* = 151 54 female 97 male	Pre-elite	**Individual:** tennis	Spain
Female adolescent soccer players' perceived motivational climate, goal orientations, and mindful engagement (Iwasaki & Fry, 2016)	Adolescent 15.59 (±*1.15*)	*N* = 190 All female	Travel avg 11 yrs exp	**Team:** soccer	USA
Predicting occurrence of and responses to psychological difficulties: The interplay between achievement goals, perceived ability, and motivational climates among Korean athletes (Kim et al., 2011)	Adult 20.28 (±*1.27*)	*N* = 404 90 female 314 male	University	**Team:** soccer, basketball, baseball, handball **Individual:** archery, tennis, golf, swimming	Korea
Achievement involvement and stress coping in elite wrestling (Kristiansen et al., 2008)	Adolescent – adult 21.8 (±*5.07*)	*N* = 82 22 female 60 male	Elite	**Individual:** wrestling	Norway Denmark Sweden Poland
Predictors of sources of self-confidence in collegiate athletes (Machida et al., 2012)	Adult 19.62 (±*1.25*)	*N* = 206 139 female 67 male	University	**Team:** basketball, field hockey, football, ice hockey, soccer, softball, volleyball **Individual:** diving, golf, ice skating, swimming, tennis, track & field	USA
The influence of dispositional and situational tendencies on adolescent girls' sport confidence sources (Magyar & Feltz, 2003)	Adolescent 14.8 (±*1.66*)	*N* = 180 All female	Competitive club avg 4 yrs exp	**Team:** volleyball	USA
The relationship between competitive anxiety, achievement goals, and motivational climates (Ntoumanis & Biddle, 1998)	Adult 21 (±*2.36*)	*N* = 146 62 female 84 male	University	**Team:** hockey, rugby, soccer, netball, basketball, volleyball	Britain
The mediating role of coping strategies on the relationship between achievement motivation and affect in sport (Ntoumanis et al., 1999)	Adult 20.83 (±*3.77*)	*N* = 355 132 female 223 male	University	**Team:** rugby, soccer, hockey, netball, basketball, cricket **Individual:** athletics	Britain
The dynamics of motivation and perceptions of control when competing in the Olympic Games (Pensgaard, 1999)	– Ages not reproted	*N* = 15 All female	Olympic	**Team:** soccer	Norway

Avg yrs exp: average years experienced

2.3 Overview

Seventeen studies were included in this systematic literature review. All 17 of the studies measured task and ego DGOs, with 11 using the TEOSQ and 6 using the POSQ, and included task and ego MCs. For MC, the inclusion requirement was for a distinction via instructions or measurement of task and ego MCs; however, every study used in this review measured perceived MCs with the Perception of Motivational Climate in Sport Questionnaire (PMCSQ). For consistency, the terms 'task' and 'ego' will be used to describe task/mastery and ego/performance DGOs and MCs[4].

Each study also reported at least one mental, emotional or physical/behavioural factor related to sport performance. Seven sections have resulted from these classifications, with the first four relating to the mental and emotional aspects of sport performance: competence and confidence, psychobiosocial states, competitive anxiety/psychological difficulties and coping strategies/controllability. The final three sections relate to the behaviour and physical aspects: performance improvement, performance satisfaction and performance evaluation. All studies have descriptive and simple correlational data to report. This review also reports the findings of moderated regression analyses conducted in six studies. These analyses tested the moderating effects of MCs on the relationship between DGOs and performance variables.

Throughout this review, all but one of the measures for the dependent variables of performance are subjective questionnaires or scales. In the few instances where a game or matches are played, the measures are still self or coach evaluations of play. The only study to measure an objective performance variable is discussed at the very end of the review. This points to the nature of studies looking at AGT in sport; with the majority of research relying heavily on mental and emotional sport performance along with subjective data. When it comes to objective sport performance, there is a gap in the literature.

[4] Although the terms mastery and performance MCs stem from a later AGT approach (Elliot, 1999; Elliot & Church, 1997), some studies based on Nicholls (1984) will use task and ego to refer to DGO and mastery and performance to refer to MC.

2.4 Study Results: Mental Performance Factors

2.4.1 Perceived Competence and Confidence

As illustrated in Table 3, nine of the 17 studies included in this review reported an analysis of perceived sport ability, competence or confidence as a performance variable in their relationships with DGOs and perceived MCs (Abrahamsen, Roberts & Pensgaard, 2008; Abrahamsen, Roberts, Pensgaard & Ronglan, 2008; Bortoli et al., 2011; Bortoli et al., 2012; Iwasaki & Fry, 2016; Kim et al., 2011; Machida et al., 2012; Magyar & Feltz, 2003; Ntoumanis & Biddle, 1998). While it has been argued that self-confidence and competence are state beliefs and perceived ability is a trait level belief (Ntoumanis & Biddle, 1998), these elements are often used interchangeably and defined generally as a mentality of certainty that one has the correct skills and ability to succeed at their sport (Bortoli et al., 2012; Iwasaki & Fry, 2016). In previous literature, self-confidence, competence and perceived ability have been shown to be beneficial to optimal performance (Moritz, Feltz, Fahrbach, & Mack, 2000; Papaioannou & Kouli, 1999; Vealey & Chase, 2008; Whitehead, Lee & Andrée, 1999).

Across the nine studies in this section, seven different measures were used to measure perceived competence, confidence and ability. Five studies used a subscale of a larger questionnaire. Two of these studies measuring perceived sports ability (Abrahamsen, Roberts & Pensgaard, 2008; Abrahamsen, Roberts, Pensgaard & Ronglan, 2008) used the same subscale of the Intrinsic Motivation Inventory (McAuley et al., 1989). Bortoli et al. (2011) used a subscale from the Physical Self-Efficacy scale (Ryckman et al., 1982). Bortoli et al. (2012) used the perceived sports competence subscale of the Physical Self-Description Questionnaire (Marsh et al., 1994) while Ntoumanis and Biddle (1998) used the state self-confidence subscale from the Competitive State Anxiety Inventory-2 (Martens et al., 1990). Iwasaki and Fry's (2016) measure of perceived confidence was the subscale "peaking under pressure," defined as the confidence an athlete has of their ability to perform to the best of their ability in intense sporting situations and measured by the Athletic Coping Skills Inventory (Smith et al., 1995a).

The study by Kim et al. (2011) made a 4-item Likert scale adapted from Duda and Nicholls (1992). Two studies (Machida et al., 2012; Magyar & Feltz, 2003) used the Sources of Sport Confidence Questionnaire (SSCQ; Vealey et al., 1998) but reported their questionnaire items differently. The SSCQ (Vealey et al., 1998) measures nine sources of confidence ranging from adaptive, self-referenced sources (mastery, physical/mental preparation, and vicarious experience) to normatively based sources outside of the athletes' immediate control (demonstration of ability, physical self-presentation and situational favorableness) to lastly, social and environmental sources (social support, environmental comfort and coach's leadership). Magyar and Feltz's (2003) reported the nine sources of sport confidence individually whereas Machida et al., (2012) grouped and reported the nine sources in two categories: controllable or uncontrollable. Controllable sources are internal and derive from the athlete (mastery and physical/mental preparation) while uncontrollable sources are external, coming from outer influences (demonstration of ability, physical self-presentation, social support, vicarious experience, environmental comfort, situational favorableness and coach leadership). Seventeen different sport confidence and competence measures were used as the dependent variables in these analyses, comprising five confidence subscales, a 4-item adapted perceived ability scale and 11 different items reported differently from the SSCQ.

The studies in this section also had different samples, which varied in age, gender and level of athlete play. Of the nine studies, three had a sample that only included young adult male and female athletes from a variety of sports. Of these, Kim et al. (2011) and Ntoumanis & Biddle (1998) both used intercollegiate athletes while Machida et al. (2012) also used college athletes but classified them as elite calibre, being from Division 1 universities in the United States. Apart from these, Abrahamsen, Roberts & Pensgaard (2008) also used a high national/elite level sample that included youth and young adult athletes with a mean of 17.8 years and standard deviation of 5.7 years. Abrahamsen, Roberts, Pensgaard and Ronglan (2008) also used an elite sample of handball players but did not report ages. Both studies by Abrahamsen and colleagues ran MANOVA analyses and found gender effects, thus reported all findings separately by gender. Along with this, the study of elite handball players (Abrahamsen, Roberts, Pensgaard & Ronglan, 2008) also reported findings for their total sample in addition to by gender. The other four studies used a sample of youth and adolescent athletes, with Bortoli et al. (2011) (ages 13.4 ± 0.5 years old) consisting of male and female athletes from a range of youth sport organisations, Bortoli et al. (2012) (ages 14.9 ± 0.8 years old) with male soccer players, Iwasaki and Fry (2016) (ages 15.59 ±1.15 years old) with female soccer players and lastly, Magyar and Feltz (2003) (ages14.8 ± 1.66 years old) focused on female volleyball players.

Overall, in terms of DGOs, task DGO was positively correlated to 13 of the 17 measures of confidence, while ego DGO was positively correlated to nine of them. Task DGO was positively related to perceived sports ability for both males and females (Abrahamsen, Roberts & Pensgaard, 2008), perceived sports ability for the overall sample but just for females when separated by gender (Abrahamsen, Roberts, Pensgaard & Ronglan (2008), perceived sports competence in youth males soccer players (Bortoli et al., 2012), peaking under pressure for youth female soccer players (Iwasaki & Fry, 2016), perceived ability for young adult intercollegiate athletes (Kim et al., 2011), controllable and uncontrollable sources of sport confidence for elite D1 college athletes (Machida et al., 2012), along with mastery, physical mental preparation, social support and vicarious experience for youth female volleyball players (Magyar & Feltz, 2003). Ego DGO was positively correlated to perceived sports ability for female elite athletes (Abrahamsen, Roberts & Pensgaard, 2008), perceived sports ability for the combined sample, female and male athletes elite handball players (Abrahamsen, Roberts, Pengaard & Ronglan, 2008), perceived competence for youth athletes (Bortoli et al., 2011), perceived sports competence for adolescent male soccer players (Bortoli et al., 2012), perceived ability for young adult intercollegiate athletes (Kim et al., 2011), self-confidence for young adult university athletes (Ntoumanis & Biddle, 1998), along with demonstration of ability, physical self-presentation, and situational favorableness for adolescent female volleyball players (Magyar & Feltz, 2003).

A perceived task MC positively correlated to nine measures of perceived sports confidence while a perceived ego MC was the only independent variable that negatively related to measures of confidence. A perceived task MC positively related to perceived sports ability for male and female elite athletes (Abrahamsen, Roberts & Pensgaard, 2008), perceived sports ability for the total sample of male and female elite handball players, but not significantly when ran separate by gender (Abrahamsen, Roberts, Pensgaard & Ronglan, 2008), to peaking under pressure (Iwasaki & Fry, 2016), to perceived ability for adult intercollegiate athletes (Kim et al., 2011), to controllable and uncontrollable sources of sport confidence to elite D1 athletes (Machida et al., 2012) and to mastery, social support, and coach's leadership sources of confidence for adolescent female volleyball players (Magyar & Feltz, 2003). Only two of the 17 relationships tested for perceived ego MC were significant, being negative correlations with perceived ability in adult intercollegiate athletes (Kim et al., 2011) and with coach's leadership source of confidence in youth female volleyball players (Magyar & Feltz, 2003). These results suggest that, for the most part, both types of DGOs and a perceived task MC positively affect feelings of confidence, competence and ability, while a perceived ego MC was either largely unrelated or actually negatively correlated with athlete perceived confidence.

As seen in Table 4, only three of the nine studies (Abrahamsen, Roberts & Pensgaard, 2008; Abrahamsen, Roberts, Pensgaard & Ronglan, 2008; Magyar & Feltz, 2003) used a moderated regression in their analysis of the relationship of DGOs and MCs with the confidence performance variable.

Abrahamsen and colleagues (2008b) centered all independent variables on the grand mean before conducting regressions looking at interactions associated with the dependent variables that were found to be significant in the correlations. Because of the gender effect, these moderated regressions were conducted separately for male and female athletes. After examining residuals and leverage points, three females' data were removed as outliers and due to their influence on the independent variables, bringing the female participant numbers from 69 to 66. In step 1, the interaction terms of ego DGO x perceived ego MC and task DGO x perceived task MC were entered. In step 2, ego DGO x perceived task MC and task DGO x perceived ego MC were added. For both male and female moderated regressions, similar results occurred, with both steps being significant for both genders in regard to perceived ability. For females, step 1 was significant at $F(2,66)=9.01$, $p<.001$ and step 2 was significant at $F(4,64)=5.00$, $p<.01$. For males, step 1 was significant at $F(2,71)=8.30$, $p<.001$ and step 2 significant at $F(4,69)=4.99$, $p<.01$. It was found that the interaction of ego DGO x perceived ego MC predicted increased perceptions of ability across both genders. The authors did not report simple slopes and only described the nature of this significant interaction by reporting, "the combination of ego DGO and perceptions of a performance MC significantly predicted higher perceptions of ability for both gender" (Abrahamsen et al., 2008b, p. 816).

After centering the task DGO, ego DGO, task MC and ego MC independent variables, Magyar and Feltz (2003) conducted nine separate 4-step hierarchical regressions. The separate regressions were ran to test all nine dependent variables of sport confidence based on the SSCQ (Vealey et al., 1998): mastery, physical/mental preparation, vicarious experience, demonstration of ability, physical self-presentation, situational favorableness, social support, environmental comfort and coach's leadership. Step 1 included the independent variables task DGO, ego DGO, task MC and ego MC as main effects of the sport confidence sources. Step 2 included all possible two-way interactions (task DGO x ego DGO, task DGO x task MC, task DGO x ego MC, ego DGO x task MC, ego DGO x ego MC and task MC x ego MC). Step 3 included all possible three-way interactions (task DGO x ego DGO x task MC, task DGO x ego DGO x ego MC, task DGO x task MC x ego MC and ego DGO x task MC x ego MC). Finally, step 4 concluded with the 4-way interaction task DGO x ego DGO x task MC x ego MC. The authors argued that the MC would be distinguished as the moderator if any of the interactions including MC were found to be significant predictors. Across all nine 4-step regressions, no interaction terms were found to be significant, leading to the authors concluding that no moderations of any sort were found. As shown in Table 4, only significant main effects were reported, lacking a *t* score but given a *p*-value. It can be seen that task DGO significantly predicted all of the adaptive sources of sport confidence: mastery, physical/mental preparation and vicarious experience. The regression also found that ego DGO, as a main effect, significantly predicted all of the normative based sources of confidence: demonstration of ability, physical self-presentation and situational favorableness. These significant main effects are aligned with the correlational data. However, the regression main effects did not align with the correlational data that found task DGO positively related to social support and coach's leadership or any of the task and ego MC correlations.

Table 3. Correlational data among variables: Perceived competence and confidence.

Authors & year	Performance Factor	DGO		Perceived MC	
		Task	Ego	Task	Ego
Abrahamsen et al., 2008a	**Perceived sports ability** (Subscale of Intrinsic Motivation Inventory: McAuley et al., 1989)	(f) .45** (m) .22***	(f) .23* (m) .02	(f) .32** (m) .33*	(f) -.13 (m) -.12
Abrahamsen et al., 2008b	**Perceived sports ability** (Subscale of Intrinsic Motivation Inventory: McAuley, et al., 1989)	(f) .33** (m) .22 (all) .27***	(f) .41*** (m) .44*** (all) .43***	(f) .19 (m) .18 (all) .18*	(f) .05 (m) .16 (all) .11
Bortoli et al., 2011	**Perceived competence** (Subscale of the Physical Self-Efficacy scale: Ryckman et al, 1982)	.227**	.184**	.131	.036
Bortoli et al., 2012	**Perceived sports competence** (Subscale of Physical Self-Description Questionnaire: Marsh et al., 1994)	.32**	.27**	.08	.03
Iwasaki & Fry, 2016	**Peaking under pressure** (Subscale of Athletic Coping Skills Inventory: Smith, et al., 1995a)	.20*	-.02	.19*	-.16
Kim et al., 2011	**Perceived ability** (4 item scale: Duda & Nicholls, 1992)	.277**	.292**	.228**	-.102*
Machida et al., 2012	**Sources of Sport Confidence** (SSCQ: Vealey et al., 1998)				
	Controllable sources (e.g., mastery)	.50**	.06	.43**	-.06
	Uncontrollable sources (e.g., situational favorableness)	.27**	-.06	.33**	.05
Magyar & Feltz, 2003	**Sources of Sport Confidence** (SSCQ: Vealey et al., 1998)				
	Mastery	.45*	-.14	.17*	-.05
	Demonstration of ability	.12	.60*	-.03	.13
	Physical/mental preparation	.42*	-.05	.14	-.03
	Physical self-presentation	.12	.33*	-.04	.04
	Social support	.29*	-.09	.23*	-.11
	Vicarious experience	.29*	-.03	.05	.11
	Environmental comfort	.10	.05	.07	-.02
	Situational favorableness	-.11	.29*	-.01	.01
	Coach's leadership	.15*	.06	.18*	-.16*
Ntoumanis & Biddle, 1998	**State Self-confidence** (Subscale of Competitive State Anxiety Inventory-2: Martens et al., 1990)	.05	.25**	.13	.08

(f) female, (m) male; *p<.05 **p<.01 ***p<.001

Table 4. Significant results of moderated hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of competence and confidence.

Authors & year	Variable	*B*	*β*	*t*	Adj. R^2	R^2 change	*F* change
Abrahamsen et al., 2008a	**Perceived ability (females)**						
	Ego DGO	0.03		0.44	.24		
	Task DGO	0.39		3.61**			
	Task MC	0.30		2.71**			
	Perceived ability (males)				.12		
	Task DGO	0.22		1.76			
	Task MC	0.28		3.11**			
Abrahamsen et al., 2008b	**Perceived ability (males)**						
	Step 1					.201	8.929***
	Ego DGO x Ego MC [a]	0.404		3.672***			
	Task DGO x Task MC	0.113		1.022			
	Step 2					.023	1.036
	Ego DGO x Ego MC [a]	0.412		3.632***			
	Task DGO x Task MC	0.038		0.314			
	Ego DGO x Task MC	0.055		0.505			
	Task DGO x Ego MC	0.160		1.362			
	Perceived ability (females)						
	Step 1					.214	9.008***
	Ego DGO x Ego MC [a]	0.343		2.980**			
	Task DGO x Task MC	0.220		1.913			
	Step 2					.024	0.995
	Ego DGO x Ego MC [a]	0.366		3.070**			
	Task DGO x Task MC	0.163		1.329			
	Ego DGO x Task MC	0.034		0.298			
	Task DGO x Ego MC	0.168		1.411			
Magyar & Feltz, 2003[b]	**Sources of Sport Confidence**						
	Mastery						
	Step 1						
	Task DGO		.45	Sig.***	.19		
	Ego DGO			Not sig.			
	Task MC			Not sig.			
	Ego MC			Not sig.			
	Physical/mental preparation						
	Step 1						
	Task DGO		.42	Sig.***	.17		
	Ego DGO			Not sig.			
	Task MC			Not sig.			
	Ego MC			Not sig.			
	Vicarious experience						
	Step 1						
	Task DGO		.29	Sig.***	.08		
	Ego DGO			Not sig.			
	Task MC			Not sig.			
	Ego MC			Not sig.			
	Demonstration of ability						
	Step 1						
	Ego DGO		.60	Sig.***	.35		
	Task DGO			Not sig.			
	Task MC			Not sig.			
	Ego MC			Not sig.			
	Physical self-presentation						
	Step 1						
	Ego DGO		.33	Sig.***	.10		
	Task DGO			Not sig.			
	Task MC			Not sig.			
	Ego MC			Not sig.			
	Situational favorableness						
	Step 1						
	Ego DGO		.29	Sig.***	.08		
	Task DGO			Not sig.			
	Task MC			Not sig.			
	Ego MC			Not sig.			

[a] simple slope direction not reported; *p<.05 **p<.01 ***p<.001

[b] Magyar & Feltz (2003): Step 2 “all two-way interactions” and Step 3 “all three-way interactions” reported to have been ran but all not significant so not displayed in their regression table.

2.5 Study Results: Emotional Performance Factors

2.5.1 PsychoBioSocial States

As seen in Table 5, three studies examined psychobiosocial states as the performance related variable. Psychobiosocial states, as explained by the Individual Zones of Optimal Functioning (IZOF) model (Hanin, 2000), encapsulate the athlete's complete performance state experience in terms of pleasant and unpleasant experiences. Psychobiosocial states are measured by a questionnaire (Bortoli et al., 2009; Bortoli & Robazza, 2007) that includes the psychological elements of emotion, cognition, and motivation, the biological elements of bodily reaction and movement, and the social elements of performance and communication. Two of the studies' sample came from young Italian athletes who had been in organized sport for 2-5 years (Bortoli et al., 2011; Bortoli et al., 2009). The third study also came from a young population of male Italian football players, but had all played at the club level with an average of 7 years of experience (Bortoli et al., 2012). For the analyses, overall psychobiosocial scores were computed and found reliable as a two-factor solution for pleasant ($\alpha = 0.84; 0.82; 0.80$) and unpleasant ($\alpha = 0.72; 0.70; 0.70$) dimensions (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012).

For DGOs, task DGO positively correlated to all pleasant psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012), while negatively correlated to all unpleasant psychobiosocial states (Bortoli et al., 2009; Bortoli et al., 2012). Ego DGO was unrelated to any psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009) except for with Bortoli et al.'s (2012) study with the slightly more experienced youth male footballers, whose ego DGO positively correlated with pleasant psychobiosocial states.

In terms of perceived MC, similar to task DGO, a perceived task MC was positively correlated to all pleasant psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012) and negatively correlated with all unpleasant psychobiosocial states (Bortoli et al., 2009; Bortoli et al., 2012). A perceived ego MC was the only variable positively correlated to all unpleasant psychobiosocial states (Bortoli et al., 2009; Bortoli et al., 2012). These findings supported the hypotheses that task DGOs and MCs relate positively to pleasant psychobiosocial states and negatively to unpleasant psychobiosocial states. Further, ego DGOs are unrelated and ego MCs negatively related to positive psychobiosocial states and often positively related to unpleasant psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012).

As seen in Table 6, two of the three studies in this section ran moderated hierarchical regressions to test if MCs moderated the relationship between DGOs and aggregated psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009). Each study ran two separate moderated regressions. Bortoli et al. (2011) ran one moderated regression that included a perceived competence score as an independent variable and another moderated regression with an actual competence score instead of the perceived competence score as an independent variable. Bortoli et al. (2009) ran one moderated regression with aggregated pleasant psychobiosocial states as the dependent variable and another moderated regression with aggregated unpleasant psychobiosocial states as the dependent variable.

Even though Bortoli et al. (2011) only was looking at pleasant psychobiosocial states as their dependent variable, the authors conducted one regression that included a "perceived competence" independent variable where the athlete scored their competence and then conducted another regression that included an "actual competence" independent variable as scored by their coach, each with the other independent variables of task DGO, ego DGO, task MC and ego MC. Step 1 of the model in both regressions was the main effect terms of all independent variables (competence, task DGO, ego DGO, task MC and ego MC) on aggregated pleasant psychobiosocial states. Step 2 of the regression saw all two-way interactions of the independent variables (task DGO x ego DGO, competence x task DGO, competence x task MC, competence x ego DGO, competence x ego MC, task DGO x task MC, task DGO x ego MC, ego DGO x task MC and ego DGO x ego MC), noticeably excluding task MC x ego MC as they were not seen as co-existing variables. Step 2 also contained three-way interactions specific to their study that was focused on competence (competence x task DGO x task MC, competence x task DGO x ego MC, competence x ego DGO x task MC, and competence x ego DGO x ego MC) (Bortoli et al., 2011). Since this review is only interested in the relationship between task and ego DGOs and task and ego MCs as the independent variables, all main effects or interactions that include perceived or actual competence as independent variables were not reported in this review.

The other study that incorporated moderated hierarchical regressions, Bortoli et al. (2009), also conducted two separate moderated regressions, one with pleasant psychobiosocial states and the other with unpleasant psychobiosocial states as the dependent variables. Unlike Bortoli et al. (2011), Bortoli et al. (2009) only included task and ego DGOs and task and ego MCs as their independent variables; neither perceived nor actual competence independence variables were included as in Bortoli et al (2011). After centering the variables, step 1 of both regressions in Bortoli et al.'s (2009) study included task DGO, ego DGO, task MC and ego MC as main effects of either pleasant or unpleasant psychobiosocial states. Step 2 included two-way interactions deemed appropriate by the authors including task DGO x ego DGO, task DGO x task MC, task DGO x ego MC, ego DGO x task MC and ego DGO x ego MC. This study did not include any three-way interactions in their analysis (Bortoli et al., 2009).

As seen in Table 6, both sets of regressions within both the studies showed, within step 1 results, task DGO significantly positively predicted all cases of pleasant psychobiosocial states while negatively predicting unpleasant psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009). Ego DGO was found to positively predict pleasant psychobiosocial states in Bortoli et al.'s (2009) study along with in the coach rated "actual competence" analysis in Bortoli et al.'s (2011) research. Further step 1 results showed a task MC also positively predicted pleasant psychobiosocial states overall (Bortoli et al., 2009) as well as in the actual competence regression (Bortoli et al., 2011). A perceived ego MC was the only variable found to positively predict unpleasant psychobiosocial states in athletes (Bortoli et al., 2009).

Within the pleasant psychobiosocial states moderated regression (Bortoli et al., 2009), step 2 analysis found two significant interactions with task DGO x ego MC and ego DGO x task MC. In regard to task DGO x ego MC, simple slopes found that when ego MC was low, the positive relationship of task DGO on pleasant psychobiosocial states (β =.58) was slightly stronger compared to when ego MC was high (β =.27), even though both were significant. Regarding the interaction ego DGO x task MC, the relation of ego DGO to pleasant psychobiosocial states was only positive when task MC was low (β =.37). These results supported their hypothesis that situational MCs were expected to moderate young athletes' DGOs in predicting pleasant psychobiosocial states.

Table 5. Correlational data among variables: PsychoBioSocial (PBS) states.

Authors & year	Performance Factor Variable	DGO		Perceived MC	
		Task	Ego	Task	Ego
Bortoli et al., 2011	**Pleasant PBS states scale** (Bortoli et al., 2009)	.412***	.099	.205***	-.083
Bortoli et al., 2009	**PBS states scale** (Bortoli & Robazza, 2007)				
	Pleasant PBS states	.413***	.110	.235***	-.095
	Unpleasant PBS states	-.304***	-.037	-.159***	.218***
Bortoli et al. 2012	**PBS states scale** (Bortoli & Robazza, 2007)				
	Pleasant PBS states	.51**	.22**	.24**	-.02
	Unpleasant PBS states	-.18**	.01	-.24**	.20**

*p<.05 **p<.01 ***p<.001

Table 6. Significant results of moderated hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of PsychoBioSocial (PBS) states.

Authors & year	Variable	*B*	S.E. *B*	*β*	*t*	Unique R^2
Bortoli et al. (2011)	**Pleasant PBS states** (perceived competence analysis)					
	Step 1					.28
	Task DGO	0.39	0.06	.31	6.09**	
	Step 2					
	Task DGO x Ego DGO				Not sig.	
	Task DGO x Task MC				Not sig.	
	Ego DGO x Ego MC				Not sig.	
	Task DGO x Ego MC				Not sig.	
	Ego DGO x Task MC				Not sig.	
	Pleasant PBS states (actual competence analysis)					
	Step 1					.23
	Task DGO	0.43	0.07	.34	6.51**	
	Ego DGO	0.09	0.04	.12	2.24*	
	Task MC	0.13	0.07	.11	2.05*	
	Step 2					
	Task DGO x Ego DGO				Not sig.	
	Task DGO x Task MC				Not sig.	
	Ego DGO x Ego MC				Not sig.	
	Task DGO x Ego MC				Not sig.	
	Ego DGO x Task MC				Not sig.	
Bortoli et al. (2009)	**Pleasant PBS states**					
	Step 1					.21
	Task DGO	0.45	0.05	.37	8.28**	
	Ego DGO	0.09	0.04	.11	2.52*	
	Task MC	0.14	0.05	.12	2.65*	
	Step 2					.03
	Task DGO x Ego DGO				Not sig.	
	Task DGO x Task MC				Not sig.	
	Ego DGO x Ego MC				Not sig.	
	Task DGO x Ego MC	-0.15	0.07	-.10	-2.14*	
	Simple slope: when ego MC is low			.59	7.99**	
	Simple slope: when ego MC is high			.27	4.47**	
	Ego DGO x Task MC	-0.12	0.05	-.11	-2.20*	
	Simple slope: when task MC is low			.37	5.06**	
	Simple slope: when task MC is high			Not reported		
	Unpleasant PBS states					
	Step 1					.14
	Task DGO	-0.22	0.04	-.26	-5.68**	
	Ego MC	0.11	0.03	.17	3.63**	
	Step 2					.03
	Task DGO x Ego DGO				Not sig.	
	Task DGO x Task MC				Not sig.	
	Ego DGO x Ego MC				Not sig.	
	Task DGO x Ego MC				Not sig.	
	Ego DGO x Task MC				Not sig.	

*p<.05 **p<.01 ***p<.001

2.5.2 Competitive Anxiety & Psychological Difficulties

As seen in Table 7, four studies incorporated the experience of psychological difficulties and competitive anxiety as their performance factor (Abrahamsen et al., 2008a; Abrahamsen et al., 2008b; Kim et al., 2011; Ntoumanis & Biddle, 1998).

Abrahamsen et al. (2008a) explained performance anxiety as unpleasant emotion that can impact ensuing performance negatively. Abrahamsen et al. (2008b) defined performance anxiety as stress encounters and stress emotions that occur in competitive MCs that could be harmful for performance. Both of these studies used the multidimensional approach to performance anxiety, which consists of a cognitive component, such as worry, and a physiological component, such as somatic symptoms (Martens et al., 1990b; Smith, Smoll & Wiechman, 1998). They also both used the Norwegian version of the Sport Anxiety Scale (SAS-N: Abrahamsen, Roberts & Pensgaard, 2006; SAS: Smith, Smoll & Schutz, 1990) to measure performance anxiety by three subscales that assess somatic anxiety, worry and concentration disruption. Kim et al. (2011) defined psychological difficulties as negative affective states during competition that are harmful to performance including "over arousal, performance worries, concentration lapse, low confidence, and frustration" (p. 35). They used a 5-item scale created by the authors and then computed into a single overall psychological difficulty score. Competitive state anxiety is described by Ntoumanis and Biddle (1998) as states expressed as either cognitive (i.e. worrisome thoughts, expectations) or somatic (i.e. physiological) anxiety in sport competition settings. Cognitive and somatic anxiety are measured by their intensity, with the Competitive State Anxiety Inventory (CSAI-2: Martens et al., 1990a), as well as by their direction on a continuum from debilitative to facilitative, by a Likert scale developed based on the directional anxiety work of Jones (1991). While both studies by Abrahamsen and colleagues (2008a; 2008b) used elite athlete samples, Kim et al. (2011) and Ntoumanis and Biddle (1998) used a sample of young adult intercollegiate athletes.

Since Abrahamsen et al. (2008a) and Abrahamsen et al. (2008b) both found gender effects, their data is reported separately for males and females. In terms of DGO, as seen in Table 7, task DGO was only significantly correlated negatively to concentration disruption in female elite athletes (Abrahamsen et al., 2008a), and negatively to worry in both female elite handball players and the overall sample of elite handball players, but not the male athletes (Abrahamsen et al., 2008b). Task DGO did not significantly relate to psychological difficulties (Kim et al., 2011) or the intensity or direction of either cognitive or somatic anxiety (Ntoumanis & Biddle, 1998). Ego DGO positively correlated with worry of male elite athletes (Abrahamsen et al., 2008a) but negatively correlated with the intensity of cognitive anxiety in intercollegiate athletes (Ntoumanis & Biddle, 1998).

Regarding MC, a task MC only negatively correlated to psychological difficulties of intercollegiate athletes while an ego MC positively correlated to psychological difficulties (Kim et al., 2011). A perceived ego MC also positively related to worry in both male and female elite athletes and to concentration disruption in female elite athletes (Abrahamsen, 2008a). Both MCs were found to be non-significant in relation to all performance anxiety of elite handball players and to intensity or direction of cognitive or somatic anxiety of intercollegiate athletes (Ntoumanis & Biddle, 1998).

Each of the four studies also ran moderated regressions, as illustrated in Table 8 (Abrahamsen et al., 2008a; Abrahamsen et al., 2008b; Kim et al., 2011; Ntoumanis & Biddle, 1998). As mentioned previously in the perceived confidence and competence section, Abrahamsen and colleagues (2008b) ran a hierarchical moderated regression for male and female athletes to test the interactions of DGO and perceived MCs on perceived ability and on sport anxiety worry. Main effects of DGO and perceived MC on worry were not statistically significant. As seen in Table 8, for step 1, ego DGO x perceived ego MC along with task DGO x perceived task MC were entered. In step 2, ego DGO x task MC and task DGO x ego MC were added. For step 3, the authors added perceived ability as an independent variable. Strictly speaking, analyses that treat perceived ability as an independent variable rather than a dependent variable do not fall within the remit of this review. However, the model was significant so will be briefly mentioned for the sake of completeness. The male sample did not render any significant interactions, but the female sample did. For the female athletes, the model was significant at step 1, $F(2,63) = 4.72$, $p < .05$, insignificant at step 2, $F(4,61) = 2.48$, $p > .05$, and significant again at step 3, $F(5,60) = 5.98$, $p < .001$. Specifically, in step 1 and step 2, the interaction of ego DGO and ego perceived MC predicted worry in the female sample. Without simple slopes reported, the authors described the nature of this interaction as “the interaction term of ego orientation and performance climate significantly predicted more performance worries in females” (p. 815). However, this significant interaction disappeared in step 3 when the perceived ability term was added and was significant.

Kim et al. (2011) ran a moderated multiple regression with the dependent variable experience of psychological difficulties. Step 1 included five main effect terms (task

DGO, ego DGO, task MC, ego MC and perceived ability). Step 2 included all two-way interaction terms (perceived ability x task DGO, perceived ability x ego DGO, perceived ability x task MC, perceived ability x ego MC, task DGO x ego DGO, task DGO x task MC, task DGO x ego MC, ego DGO x task MC and ego DGO x ego MC), purposely excluding task DGO x ego DGO as contrasting constructs (Kim et al., 2011). Lastly, step 3 included five three-way interaction terms the authors felt theoretically appropriate for their study (perceived ability x task DGO x ego DGO, perceived ability x ego DGO x task MC, perceived ability x ego DGO x ego MC, *task DGO x ego DGO x task MC* and *task DGO x ego DGO x ego MC*) with only the final two interactions listed in italics appropriate for this literature review. As mentioned before, only interaction terms between task and ego DGOs and task and ego MCs are considered in this review, so the three-way interactions including perceived ability are not discussed. It was unclear why the authors chose these five three-way interactions particularly, all including ego DGO but only three including task DGO. Because no interaction entered at the step 2 level reached a level of significance, only step 1 data was reported, with ego MC being the only main effect to positively predict the experience of psychological difficulties.

Ntoumanis and Biddle (1998) ran moderated hierarchical regressions to see if task and ego MCs and self-confidence moderated the relationship of DGOs on any anxiety responses. The authors reported partialling out main effects and stated the two interactions they were interested in were the two-way interaction of task DGO x task MC along with the three-way interaction ego DGO x ego MC x self-confidence. No specific data was reported; however, it was said that interaction terms were all found to be insignificant. The authors attributed this to low statistical power (Ntoumanis & Biddle, 1998).

Table 7. Correlational data among variables: Competitive anxiety and psychological difficulties.

Authors & year	Performance Factor	DGO Task	DGO Ego	Perceived MC Task	Perceived MC Ego
Abrahamsen et al., 2008a	**Performance Anxiety** (Sport Anxiety Scale-Norwegian: Abrahamsen et al., 2006)				
	Somatic anxiety	(F) .04 (M) .04	(F) -.02 (M) .02	(F) .13 (M) -.04	(F) .15 (M) .03
	Worry	(F) -.13 (M) -.10	(F) .01 (M) .26**	(F) -.14 (M) -.14	(F) .31** (M) .39*
	Concentration disruption	(F) -.26 *** (M) -.05	(F) -.17 (M) .16	(F) -.16 (M) -.03	(F) .25*** (M) .13
Abrahamsen et al., 2008b	**Performance Anxiety** (Sport Anxiety Scale-Norwegian: Abrahamsen et al., 2006)				
	Somatic anxiety	(F) -.15 (M) -.17 (All) -.16	(F) -.12 (M) -.04 (All) -.06	(F) .17 (M) -.20 (All) -.03	(F) .03 (M) -.08 (All) -.02
	Worry	(F) -.33** (M) -.07 (All) -.19*	(F) -.11 (M) -.03 (All) -.12	(F) -.18 (M) -.01 (All) -.10	(F) .16 (M) .04 (All) .06
	Concentration disruption	(F) -.17 (M) .04 (All) -.05	(F) -.19 (M) .02 (All) -.13	(F) -.01 (M) -.01 (All) -.03	(F) .12 (M) -.01 (All) .03
Kim et al., 2011	**Psychological difficulties** (5-item scale created by authors)	.011	.041	-.113*	.213**
Ntoumanis & Biddle, 1998	**Anxiety intensity** (CSAI-2: Martens et al., 1990)				
	Cognitive	.00	-.19*	-.09	-.03
	Somatic	.07	-.14	-.02	-.05
	Anxiety direction (Likert scale created by authors)				
	Cognitive	.00	.13	.04	.05
	Somatic	.00	.06	.06	.00

(F) female, (M) male; *p<.05 **p<.01 ***p<.001

Table 8. Results of moderated hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of competitive anxiety and psychological difficulties.

Authors & year	Variable	*B*	*β*	*t*	R^2/ Adj. R^2	ΔR^2/ R^2 change	*F* change
Abrahamsen et al., 2008a	**Sport anxiety**						
	Worry (f)				.14		
	Ego MC	0.20		2.74**			
	Worry (m)				.24		
	Ego DGO	0.10		1.77			
	Ego MC	0.22		3.21**			
	Concentration disruption (f)				.14		
	Task DGO	-0.19		-1.71			
	Ego MC	0.18		2.32*			
Abrahamsen et al., 2008b	**Sport anxiety**						
	Worry (f)						
	Step 1					.130	4.715*
	Ego DGO x Ego MC [a]	0.358		3.034**			
	Task DGO x Task MC	-0.021		-0.181			
	Step 2					.010	0.351
	Ego DGO x Ego MC [a]	0.337		2.444*			
	Task DGO x Task MC	0.019		0.146			
	Ego DGO x Task MC	-0.098		-0.775			
	Task DGO x Ego MC	0.045		0.324			
Kim et al., 2011	**Psychological difficulties**						
	Step 1				.27	.075***	
	Task DGO	0.149	.02	0.41			
	Ego DGO	0.497	.09	1.50			
	Task MC	-0.444	-.06	-1.09			
	Ego MC	1.049	.19	3.72***			
	Step 2: all 2-way interactions						
	Step 3: all 3-way interactions						
Ntoumanis & Biddle, 1998	**Anxiety intensity**						
	Cognitive						
	Step 1: main effects	Not reported					
	Step 2: Task DGO x Task MC	Not sig.					
	Somatic						
	Step 1: main effects						
	Step 2: Task DGO x Task MC	Not sig.					
	Anxiety direction						
	Cognitive						
	Step 1: main effects	Not reported					
	Step 2: Task DGO x Task MC	Not sig.					
	Somatic						
	Step 1: main effects	Not reported					
	Step 2: Task DGO x Task MC	Not sig.					

(f) female, (m) male; [a] simple slope direction not reported; *p<.05 **p<.01 ***p<.001

2.5.3 Coping Strategies and Controllability

As seen in Table 9, six studies examined athlete coping strategies and perceived controllability of anxiety or psychological difficulties experienced during competition through 13 different measures. Controllability is defined as the perception of control over stressful situations (Kim et al., 2011) and how to deal with cognitive anxiety (Jones, 1995; Pensgaard, 1999). Similarly, coping is defined as attempts to deal with sport demands and processes of implementing strategies and managing stress, reacting in ways to allow for enhanced performance (Lazarus, 1999; Lazarus & Folkman, 1984).

Abrahamsen et al. (2008b) explain that successful coping is a way of avoiding poor performance brought on by performance anxiety. They believe particularly in the application of social support, an environmentally based resource, during performance as a successful coping technique (Smith, 1989; Smith et al., 1995b; Smith, Smoll & Ptacek, 1990). To measure this social support coping technique with their elite handball player sample, Abrahamsen et al. (2008b) used the Brief-COPE, social support scales (Carver, 1997), which assess the use of emotional and instrumental social support.

Iwasaki and Fry (2016) specify a coping strategy in their study of adolescent female soccer players called mindful engagement, described as a positive intervention strategy that focuses attention on the task at hand and helps perceived control of the situation and is measured by a mindfulness scale (Cognitive & Affective Mindfulness Scale, Revised: Feldman et al., 2007).

Kim et al. (2011) have one measure for controllability in their study of intercollegiate athletes that uses a 5-item scale created by the authors. They also have a measure of coping strategies, divided into approach coping (i.e., emotional calming and active planning) and avoidance coping (i.e., mental withdrawal), which are measured using the Approach to Coping in Sport Questionnaire (Kim et al., 2003).

Kristiansen et al. (2008) similarly measure adaptive and maladaptive coping strategies, using the Brief COPE (Carver, 1997) with their sample of national and international elite wrestlers. They report an overall score along with individual scores for each of the types of coping. Adaptive coping includes acceptance, active coping, planning, religion, emotional support, instrumental support, positive reframe and humor. Maladaptive coping includes behavioral disengagement, venting, self-distraction, substance use, self-blame and denial.

Ntoumanis et al. (1999) used a single-item measure for perceived control based on the work of Kaissidis-Rodafinos et al. (1997) in their study with experienced British university athletes. They also assessed coping strategies using the COPE inventory (Crocker & Graham, 1995), which included measures of effort, social support, venting, suppression, disengagement and distancing.

Lastly, Pensgaard's (1999) study of a Norwegian Olympic female soccer team's perceived control before and immediately after the Olympic games used a single item measure based on research by Kaissidis-Rodafinos, Anshel & Porter (1997).

As seen in Table 9, correlational data found that task DGO was positively related to mindful engagement with adolescent female soccer players (Iwasaki & Fry, 2016), approach coping strategies with intercollegiate athletes (Kim et al., 2011) adaptive coping strategies overall along with specific strategies of emotional support and instrumental support, the maladaptive coping technique of self-distraction with elite wrestlers, the COPE strategies of effort, social support, and suppression, but negatively related to disengagement and distancing with experienced university athletes (Ntoumanis et al., 1999) and finally perceived control with Olympic female soccer players after the Olympic Games. Ego DGO positively correlated to approach coping with intercollegiate athletes (Kim et al., 2011), to the adaptive COPE strategy acceptance with elite wrestlers, and the coping strategy of venting with university athletes (Ntoumanis et al., 1999).

A task MC positively correlated to the most strategies and feelings of control: mindful engagement in female soccer players (Iwasaki & Fry, 2016), controllability of difficulties and approach coping with intercollegiate athletes (Kim et al., 2011), adaptive coping strategies overall and specifically those of active coping, emotional support, instrumental support and positive reframe in elite wrestlers (Kristiansen et al., 2008) and the coping strategies of effort, social support, and suppression while negatively with disengagement in British university athletes (Ntoumanis et al., 1999). An ego MC negatively related to many of the adaptive coping strategies: instrumental social support for elite handball players overall and for the male players specifically (Abrahamsen et al., 2008b), mindful engagement in female soccer players (Iwasaki & Fry, 2016), and the adaptive coping strategies acceptance and positive reframe in elite wrestlers (Kristiansen et al., 2008). A perceived ego MC also positively related to many of the maladaptive coping strategies: avoidance coping strategies in intercollegiate athletes (Kim et al., 2011), the maladaptive coping strategy of denial in elite wrestlers (Kristiansen et al., 2008) and the strategy of disengagement in British university athletes (Ntoumanis et al., 1999). On a positive note, a perceived ego MC did also positively relate to approach coping as well as the avoidance coping in intercollegiate athletes (Kim et al., 2011) along with the adaptive coping strategy of religion in elite wrestlers (Kristiansen et al., 2008).

As seen in Table 10, three of the six studies in this category used a moderated regression (Iwasaki & Fry, 2016; Kim et al., 2011; Pensgaard, 1999). Iwasaki and Fry (2016) only measured task and ego DGOs as main effects and only their interaction (task DGO x ego DGO) in their moderation analysis. The analysis found that task DGO alone as a main effect was significant in predicting mindful engagement. The main effect of ego DGO and the interaction term task DGO x ego DGO were insignificant (Iwasaki & Fry, 2016).

Kim et al. (2011) ran separate moderated multiple regression analyses for the dependent variables controllability, approach coping and avoidance coping. As discussed earlier in the psychological difficulties section, Kim et al. (2011) used a three-step regression approach using the main effect variables task DGO, ego DGO, task MC, ego MC and perceived ability. Since this review is only reporting on DGOs and MCs, step 1 analysis consisted of the four independent variables task and ego DGO and task and ego MC. Step 2 included the five two-way interactions possible from these variables without including task MC x ego MC since they are contrasting constructs. Step 3 included the three-way interaction terms task DGO x ego DGO x task MC and task DGO x ego DGO x ego MC (Kim et al., 2011).

Across the three regressions, step 1 analysis found that task DGO positively predicted approach coping and that a task MC positively predicted controllability and approach coping. Interestingly, ego MC was found to positively predict both approach and avoidance coping. Furthermore, step 2 analysis of approach coping found a significant interaction of ego MC x task DGO. Simple slopes determined when ego MC perception is low, participants with higher task DGO scores predict more approach coping use to deal with psychological difficulties while playing (Kim et al., 2011).

Lastly, step 3 in the moderated regression of controllability, a significant three-way interaction, task DGO x ego DGO x task MC, was found (Kim et al., 2011). Simple slopes tests revealed that athletes with higher ego DGOs within a task MC are seen to increase in their task DGO which allows them to feel they have more controllability over coping with their stress (Kim et al., 2011).

Pensgaard (1999) simply ran a regression and did not include any interaction terms. It was found that task DGO positively predicted perceived control in the Olympic athletes. Ego DGO, ego MC and task MC all were not significant in predicting athlete perceived control.

Table 9. Correlational data among variables: Coping strategies and controllability.

Authors & year	Performance Factor	DGO		Perceived MC	
		Task	Ego	Task	Ego
Abrahamsen et al., 2008b	**Social support** (Brief COPE scales: Carver, 1997)				
	Social support – Emotional	(F) -.07 (M) -.01 (All) -.04	(F) .04 (M) -.03 (All) -.02	(F) -.05 (M) -.01 (All) -.03	(F) .14 (M) -.15 (All) -.16
	Social support – instrumental	(F) -.22 (M) -.16 (All) .03	(F) .16 (M) .02 (All) .08	(F) .09 (M) -.03 (All) .04	(F) .11 (M) -.24* (All) -.19*
Iwasaki & Fry, 2016	**Mindful engagement** (Cognitive & Affective Mindfulness Scale, Revised: Feldman et al., 2007)	.36*	-.00	.35*	-.20*
Kim et al., 2011	**Controllability of difficulties** (5-item scale created by authors)	.042	.038	.212**	-.081
	Coping strategies (ACSQ: Kim et al., 2003)				
	Approach coping	.238**	.155**	.204**	.109*
	Avoidance coping	.031	.002	-.055	.208**
Kristiansen et al., 2008	**Adaptive coping strategies** (Brief COPE: Carver, 1997)	.22*	.03	.34**	-.09
	Acceptance	.12	-.22*	.21	-.40**
	Active coping	.16	-.02	.28*	-.01
	Planning	.02	-.05	.15	.05
	Religion	.02	.13	.17	.34**
	Emotional support	.27*	.14	.26*	-.04
	Instrumental support	.27*	.05	.30**	-.08
	Positive reframe	.22	-.01	.28*	-.27*
	Humor	.04	.05	-.01	.11
	Maladaptive coping (Brief COPE: Carver, 1997)	.01	.06	.13	.17
	Behavioral disengagement	-.16	.09	.01	.16
	Venting	.03	-.05	.16	.08
	Self-distraction	.33**	.20	.20	.17
	Substance use	-.07	.06	.06	.18
	Self-blame	.05	-.07	.03	-.01
	Denial	-.09	.02	-.04	.33**
Ntoumanis et al., 1999	**Coping Strategies** (COPE; Crocker & Graham, 1995)				
	Effort (+ coping)	.18**	.07	.25**	.01
	Social support (+ coping)	.15**	.05	.24**	.06
	Venting (- coping)	.04	.18**	-.01	.09
	Suppression (- coping)	.17**	.06	.18**	.01
	Disengagement (- coping)	-.12*	.01	-.14**	.12*
	Distancing (- coping) (Ways of Coping Questionnaire: Folkman et al., 1986)	-.13*	.01	-.03	.02
	Perceived control *(+ coping)* (single item adapted: Folkman et al., 1993)	.01	-.04	.05	-.07
Pensgaard, 1999	**Perceived control** (single item: Kaissidis-Rodafinos et al., 1997)				
	Prior to competition	.36	-.04	.38	-.22
	Post competition	.62*	-.19	.32	-.18

*p<.05 **p<.01 ***p<.001

Table 10. Results of moderated hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of coping strategies and controllability.

Authors & year	Variable	*B*	*β*	*t*	R^2	ΔR^2
Iwasaki & Fry, 2016	**Mindful engagement**					
	Step 1					
	Task DGO			Sig.**	.36	
	Ego DGO			Not Sig.	.01	
	Step 2					
	Task DGO x Ego DGO			Not Sig.	.00	
Kim et al., 2011	**Controllability**					
	Step 1				.25	.06***
	Task DGO	-0.159	-.03	-0.48		
	Ego DGO	-0.073	-.01	-0.24		
	Task MC	1.132	.19	3.55***		
	Ego MC	-0.132	-.03	-0.16		
	Step 2	Not sig.				
	Step 3				.33	.03*
	Task DGO x Ego DGO	0.540	.09	1.11		
	Task MC x Task DGO	0.500	.04	0.64		
	Task MC x Ego DGO	-0.021	.00	-0.32		
	Ego MC x Task DGO	-0.470	-.05	-0.77		
	Ego MC x Ego DGO	-0.259	-.04	-0.64		
	Task DGO x Ego DGO x Task MC	3.124	.23	3.09**		
	Simple slope: when ego DGO high + task DGO high + task MC high		1.178	1.95*		
	Task DGO x Ego DGO x Ego MC	0.319	.05	0.47		
	Approach coping					
	Step 1				.33	1.12***
	Task DGO	0.017	.16	2.88*		
	Ego DGO	0.016	.02	0.30		
	Task MC	0.229	.18	3.48***		
	Ego MC	0.146	.16	3.19**		
	Step 2				.39	.04*
	Task DGO x Ego DGO	0.125	.11	1.65		
	Task MC x Task DGO	0.057	.02	0.42		
	Task MC x Ego DGO	-0.193	-.10	-1.64		
	Ego MC x Task DGO	-0.267	-.16	-2.67**		
	Simple slope: when ego MC is low		.35	6.65***		
	Ego MC x Ego DGO	0.068	.05	0.17		
	Step 3: all 3-way interactions	Not sig.				
	Avoidance Coping					
	Step 1				.22	.05**
	Task DGO	0.040	.03	0.60		
	Ego DGO	-0.032	.03	-0.52		
	Task MC	-0.035	-.24	-0.46		

	Ego MC	0.214	.21	4.09***	
	Step 2: all 2-way interactions	Not sig.			
	Step 3: all 3-way interactions	Not sig.			
Pensgaard, 1999	**Perceived Control**				
	Ego DGO		-.02		.00
	Task DGO		.59**		.34
	Ego MC		-.29		.06
	Task MC		.39		.10

*p<.05 **p<.01 ***p<.001

2.6 Study Results: Behavioural Performance Factors

2.6.1 Performance Improvement

As seen in Table 11, three studies explored performance improvement as the performance variable in their analysis of DGOs and perceived MCs. Balaguer et al. (1999) and Balaguer et al. (2002) measured athlete performance improvement at the technical, tactical, physical and psychological level. Iwasaki and Fry (2016) measured the extent that athletes actively use methods to make improvements in their sport, favoured practice strategy use. The key findings for DGO were that Task DGO was positively related to physical performance improvement in (Balaguer et al., 2002) and practice strategy use for overall performance improvement (Iwasaki & Fry, 2016). However, Ego DGO did not relate to any measures of performance improvement.

For MC, perceived task MCs positively correlated to the technical, tactical, and psychological levels in both Balaguer et al. (2002) and Balaguer et al. (1999), along with relating to physical and performance improvement (Balaguer et al., 2002) and practice strategy use (Iwasaki & Fry, 2016), only not significantly relating to physical improvement in one study (Balaguer et al., 1999). Ego MC did not relate to any performance improvements at all.

As seen in Table 12, two of the three studies conducted hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of performance improvement. Balaguer et al. (2002) found a positive main effect of task MC on overall perceived improvement. Ego MC and both ego and task DGOs were not significant. Previous work by Balaguer et al. (1999) also reported that task MC was a positive main effect for psychological perceived improvement. Likewise, ego MC and both ego and task DGOs were not significant. It was also determined that there were no significant main effects of task and ego MC or task and ego DGO for perceived improvement at the technical, tactical or physical level. Thus, the two studies that conducted the hierarchical regression analyses in this section (Balaguer et al., 2002; Balaguer et al., 1999) provided evidence that task MC is conducive to perceived improvement.

Table 11. Correlational data among variables: Performance improvement.

Authors & year	Performance Factor	DGO		Perceived MC	
		Task	Ego	Task	Ego
Balaguer et al., 2002	**Perceived improvement** (Created scale: Balaguer et al., 1999)				
	Technical	.10	.08	.33***	-.04
	Tactical	.14	.03	.38***	-.09
	Physical	.21**	.07	.43***	.03
	Psychological	.13	-.01	.29***	-.08
	Performance	.06	.07	.30***	-.07
Balaguer et al., 1999	**Perceived improvement** (Scale created by authors)				
	Technical	.05	-.01	.14*	-.10
	Tactical	.11	-.01	.13*	-.03
	Physical	.11	.08	.02	.07
	Psychological	.09	.06	.26***	-.05
Iwasaki & Fry, 2016	**Improvement strategies used** (Practice Strategy Use Questionnaire: Boyce et al., 2009)	.57*	-.04	.55*	.01

*p<.05 **p<.01 ***p<.001

Table 12. Results of hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of performance improvement.

Authors & year	Variable	*B*	*F*-value	R^2*Change*
Balaguer et al., 2002	**Perceived Improvement – Overall**			
	Step 1		23.17	.22
	Ego MC	0.14		
	Task MC	0.51***		
	Step 2		1.21	.01
	Ego DGO	0.05		
	Task DGO	0.10		
Balaguer et al., 1999	**Perceived Improvement – Technical**			
	Step 1		0.12	.00
	Ego DGO	-0.01		
	Task DGO	-0.07		.02
	Step 2		2.50	
	Ego MC	-0.03		
	Task MC	0.18		
	Perceived Improvement – Tactical			
	Step 1		0.87	.01
	Ego DGO	-0.01		
	Task DGO	0.06		
	Step 2		0.36	.01
	Ego MC	0.01		
	Task MC	0.07		
	Perceived Improvement – Physical			
	Step 1		1.34	.01
	Ego DGO	0.04		
	Task DGO	0.12		
	Step 2		0.76	.02
	Ego MC	0.09		
	Task MC	-0.02		
	Perceived Improvement – Psychological			
	Step 1		1.19	.01
	Ego DGO	0.07		
	Task DGO	-0.08		
	Step 2		7.24	.08
	Ego MC	0.00		
	Task MC	0.30**		

*p<.05 **p<.01 ***p<.001

2.6.2 Performance Satisfaction

This portion of the review reports the findings from Balaguer et al. (2002) and Balaguer et al.'s (1999) studies on athlete's satisfaction with their competition results and level of play. As seen in Table 13, task DGO positively correlated to athlete satisfaction with competitive results in Balaguer et al.'s (1999) study of adolescent tennis players, but not in their subsequent study of handball players (Balaguer et al., 2002). Ego DGO did not correlate with any type of satisfaction. Regarding MCs, a task MC positively correlated to satisfaction with level of play in both studies of tennis players (Balaguer et al., 1999) and handball players (Balaguer et al., 2002) and also to satisfaction with results in Balaguer et al.'s (1999) study. On the other hand, an ego MC negatively correlated to satisfaction with results, while also positively correlating to level of play (Balaguer et al., 1999). Both studies ran a hierarchical regression analyses (see Table 14), but neither ran a moderated regression to test for interactions. As depicted in Table 14, Balaguer et al. (2002) found that a task MC predicted overall performance satisfaction, while ego MC and task and ego DGOs did not predict overall performance satisfaction. Moreover, Balaguer et al. (1999) found that a task MC predicted competition results (e.g., end-of-game results) satisfaction and level of play satisfaction. The regression analyses conducted by Balaguer and colleagues (2002; 1999) highlighted the predictive nature of task MC on performance satisfaction. Meanwhile, the results of these two studies suggested that ego MC and task and ego DGOs did not have a predictive relationship with the aforementioned performance satisfaction.

Table 13. Correlational data among variables: Performance satisfaction.

Authors & year	Performance Factor	DGO		Perceived MC	
		Task	Ego	Task	Ego
Balaguer et al., 2002	**Satisfaction with:** (7-point Likert scale created by authors)				
	Level of play	.05	.11	.21**	.11
	Results	.03	.08	.09	.07
Balaguer et al., 1999	**Satisfaction with:** (7-point Likert scale created by authors)				
	Level of play	.12	.03	.23**	.13*
	Results	.14*	.00	.23**	-.16*

*p<.05 **p<.01 ***p<.001

Table 14. Results of hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of performance satisfaction.

Authors & year	Variable	*B*	*F*-value	R^2 *Change*
Balaguer et al., 2002	**Satisfaction – Overall**			
	Step 1		5.71	0.07
	Ego MC	0.20		
	Task MC	0.26***		
	Step 2		0.49	0.01
	Ego DGO	0.08		
	Task DGO	0.01		
Balaguer et al., 1999	**Satisfaction – Results**			
	Step 1		2.64	0.03
	Ego DGO	0.02		
	Task DGO	0.04		
	Step 2		4.02	0.04
	Ego MC	-0.13		
	Task MC	0.16*		
	Satisfaction – Level of Play			
	Step 1		1.11	0.01
	Ego DGO	0.04		
	Task DGO	-0.03		
	Step 2		4.76	0.05
	Ego MC	-0.08		
	Task MC	0.22*		

*p<.05 **p<.01 ***p<.001

2.6.3 Performance Evaluation

For the final section of this review, as seen in Table 15, the two studies included here focused on analysis and evaluation of actual performances as their dependent variable. Cervelló, Santos Rosa, Calvo, Jiménez, and Iglesias (2007) studied youth tennis players and measured the athlete's and the coach's self-assessment of performance immediately following a tennis match as a subjective measure of performance. Buch, Nerstad, Aandstad and Safvenbom (2016) conducted an experiment with military cadets using treadmill running and used maximal oxygen uptake as an objective measure of performance.

To start with the subjective study, Cervelló et al. (2007) conducted a study with 151 pre-elite youth tennis players. They measured task and ego DGOs with the POSQ, and the PMCSQ for perceived MC. Performance outcome data came from two subjective measures of performance post-match, a single overall Likert-scale assessment by the athlete, and a single overall Likert-scale assessment by the coach. Analysis of behavioral coefficients revealed that task DGO was significantly positively related to athlete self-assessment of performance. Ego DGO was significantly positively related to coach performance assessment. A task perceived MC was positively related to player self-assessment of performance while an ego perceived MC was not related to either performance assessments.

For the objective study, Buch et al. (2016) ran an experiment with 123 military cadets. Task and ego DGOs were measured with the POSQ, perceived task or ego MC with the PMCSQ, and the performance outcome with an objective measure of maximal oxygen uptake (VO_{2max}) while performing a treadmill fitness test determined by a calibrated online system. The VO_{2max} measure was used because it is one of the best ways to capture exercise capacity and aerobic fitness levels, but also effort exerted, with the higher the VO_{2max} score, the better fitness and exertion level, thus performance, is indicated (Vanhees et al., 2005).

Correlational data found that neither task nor ego DGOs were significantly related to VO_{2max} scores. A perceived ego MC did not significantly correlate with VO_{2max} score either; however, a perceived task MC significantly positively related to VO_{2max} score.

As seen in Table 16, Buch et al. (2016) then conducted a hierarchical moderated regression to test the interactions of DGOs and MCs on the performance variable. After centering the predictors, the control variables of age, gender, academy and eagerness to exercise score, were entered into step 1 along with ego MC and task MC. Results found that when controlling for demographics and eagerness to exercise, neither task MC (β =.08, *n.s.*) or ego MC (β = -.14, *n.s.*) was a significant predictor of VO_{2max} score. In step 2, task DGO and ego DGO were added. Results of this step found that now ego MC significantly and negatively predicted VO_{2max} score (β = -.17, p<.05). In step 3, all two-way interactions were entered, but main effects or interactions were significant. In step 4, all three-way interactions were entered. Results indicate at this step, the two-way interaction ego MC x ego DGO became significant and that both three-way interactions, ego MC x task DGO x ego DGO and task MC x task DGO x ego DGO, significantly predicted VO_{2max} score.

For the three-way interactions, the relationship between ego MC and VO_{2max} was moderated by ego DGO and task DGO. Slope analysis determined that the lower the task DGO and higher the ego DGO, the more positive the relationship was between ego MC and VO_{2max}. Slope analysis also showed that all other combinations of DGOs (low task DGO + low ego DGO, high task DGO + low high ego DGO and high task DGO + low ego DGO) actually produced negative relationships between ego MC and VO_{2max} score. This suggests it is crucial that a low task DGO is combined with a high ego DGO in order for a positive relationship between an ego MC and VO_{2max}.

The relationship between task MC and VO_{2max} was moderated by ego DGO and task DGO, with slope analysis indicating that when task DGO is high, the positive relationship is stronger with those who have lower ego DGOs than those with higher ego DGOs, even though the latter relationship is also positive. Similar to the three-way interaction for ego MC, it was also found that the relationship between task MC and VO_{2max} has a strong positive relationship in those with low task DGO and high ego DGO. Finally, there was only a strong negative relationship between task MC and VO_{2max} in participants with low task DGO and low ego DGO.

Table 15. Correlational data among variables: Performance evaluation.

Authors & year	Performance Factor	DGO		Perceived MC	
		Task	Ego	Task	Ego
Buch, et al. (2016)	**Treadmill maximal oxygen uptake (VO_{2max})** (Oxycon Pro: calibrated treadmill & online, metabolic system)	.01	.06	.28**	-.12
Cervelló, Rosa, Calvo, Jiménez & Iglesias (2007)	**Assessment of match performance** (1 item Likert scale question)				
	Player self-assessment	.25**	.10	.18*	.09
	Coach assessment	.03	.16*	.05	-.05

*p<.05 **p<.01 ***p<.001

Table 16. Results of moderated hierarchical regression analyses of DGOs (task and ego) and MCs (task and ego) as predictors of treadmill $V0_{2max}$ performance.

Study	Variable	β	R^2	ΔR^2
Buch, et al. (2016)	**Maximal oxygen uptake (VO_{2max})**			
	Step 1		.35	
	Task MC	0.08		
	Ego MC	-0.14		
	Step 2		.36	.01
	Task MC	0.14		
	Ego MC	-0.17*		
	Task DGO	-0.14		
	Ego DGO	0.04		
	Step 3		.39	.03
	Task MC	0.14		
	Ego MC	-0.18		
	Task DGO	-0.16		
	Ego DGO	0.06		
	Ego MC x task DGO	-0.07		
	Ego MC x ego DGO	0.10		
	Task MC x task DGO	-0.07		
	Task MC x ego DGO	0.03		
	Step 4		.43	.03*
	Task MC	0.13		
	Ego MC	-0.18		
	Task DGO	-0.10		
	Ego DGO	0.09		
	Ego MC x task DGO	-0.05		
	Ego MC x ego DGO	0.28*		
	Simple slope: direction not reported			
	Task MC x task DGO	0.03		
	Task MC x ego DGO	0.10		
	Ego MC x task DGO x ego DGO	-0.39*		
	Simple slope: ego MC positive effect when low task DGO x high ego DGO			
	Simple slope: ego MC negative effect when low task DGO x low ego DGO			
	Task MC x task DGO x ego DGO	-0.42*		
	Simple slope: task MC positive effect when high task DGO x low ego DGO			
	Simple slope: task MC positive effect when low task DGO x high ego DGO			
	Simple slope: task MC negative effect when low task DGO x low ego DGO			

*p<.05 **p<.01 ***p<.001

2.7 Discussion

The purpose of this systematic review was to report the literature in sport that examines the relationship between the AGT independent variables of task and ego DGOs, task and ego MCs, and dependent variables of sport performance. This systematic literature review identified 17 studies that met the criteria for reporting on the relationship or interactions between DGOs, perceived MCs and mental, emotional and behavioural performance measures in sport. All data was analysed with correlations and eight studies with multiple moderated regressions.

As discussed in Section 1.1.1, AGT had three main sets of predictions about goal choice, subjective experience and performance. The first set of predictions relating to goal choice were not examined in this literature review due to the use of the PMCSQ to measure perceived MC by all of the studies. This meant there were no manipulations to the MC which would have required participants to choose if they would go forward with task or ego goals. Instead the MC was just measured and interpreted by how the participants scored it on the questionnaire. The second and third set of predictions relating to subjective experience and performance were addressed in the outcomes of these studies of this systematic review. AGT predicts for subjective experience that task DGO and task MC would increase positive effort attributions and positive affective experiences, such as satisfaction and confidence. AGT also predicts that ego DGO and ego MC would increase negative ability attributions and negative affective experiences, such as feelings of constraint, reduced satisfaction and a decreased interest in improvement and motivation. With respect to performance, AGT predicts task DGO and task MC will lead to more effort, more efficient performance and more sustainability and longevity compared to ego DGO and MC. AGT also predicts for ego DGO and ego MC, effort can be high and produce effective performance only when it is perceived that high effort is necessary for high ability demonstration. In any other circumstance, high effort and effective performance will not be observed.

Overall, a task DGO was associated with positive outcomes. It positively related to perceived sports ability (Abrahamsen et al., 2008a; 2008b; Kim et al., 2011), perceived competence (Bortoli et al., 2011; Bortoli et al., 2012), peaking under pressure (Iwasaki & Fry, 2016), and sport confidence (Machida et al 2012; Magyar & Feltz, 2003). Task DGO also positively related to pleasant psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012), and while being negatively related to unpleasant psychobiosocial states (Bortoli et al., 2009; Bortoli et al., 2012), and performance anxiety

(Abrahamsen et al., 2008a; 2008b). Finally, task DGO positively correlated to mindful engagement (Iwasaki & Fry, 1016), approach and adaptive coping strategies (Kim et al., 2011; Kristiansen et al., 2008; Ntoumanis et al., 1999) and perceived control immediately following a match (Pensgaard, 1999).

An ego DGO correlated with negative variables such as uncontrollable sources of sport confidence (Magyar & Feltz, 2003), negative coping strategy of venting (Ntoumanis et al., 1999), and performance anxiety shown by worry in males (Abrahamsen et al., 2008). However, ego DGOs were positively correlated with perceived ability and approach coping (Kim et al., 2011). For this result, the authors discussed that their sample of Korean college athletes' task and ego DGO scores positively correlated so it was both DGOs that correlated with perceived ability and approach coping. Also, they discussed "an ego-oriented attitude towards learning is not an inadequate approach in Korea because of the major emphasis on better performance than others in educational systems or sport settings" (p. 42) explaining why ego DGO related to positive ability perceptions and coping strategies (Kim et al., 2011). Ego DGO was also found to positively correlate with self-confidence (Ntoumanis & Biddle, 1998), particularly the external sources of sport confidence (Magyar& Feltz, 2003). Ntoumanis and Biddle (1998) explain that ego DGO relate to state self-confidence since it was also accompanied by perceptions of high ability. However, their discussion concludes that even though this is possible in the short-term, ego DGO could still be problematic in the long-term since the drive towards winning is not as stable as the drive to learning as found in task DGO.

A consistent pattern throughout the studies included in this systematic review is that a perception of task MC related to positive outcomes while a perception of ego MC related to negative ones. For example, a perceived mastery MC positively related to performance improvement (Balaguer et al., 2002; Balaguer et al., 1999), satisfaction with competitive results and level of play (Balaguer et al., 1999), pleasant psychobiosocial states (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012), perceived ability, controllability, approach coping (Kim et al., 2011; Ntoumanis et al., 1999), sports confidence (Machida et al., 2012; Magyar & Feltz, 2003), mindful engagement, and peaking under pressure (Iwasaki & Fry, 2016). One study found that a perceived ego MC related to the positive outcome of satisfaction of athlete level of play, but this analysis also revealed that perceived ego MC was negatively associated with satisfaction with competition results (Balaguer et al., 1999). Other than that, an ego MC positively related to psychological difficulties (Kim et al., 2011), negative coping methods (Ntoumanis et al., 1999), and unpleasant BPS states (Bortoli et al., 2009; Bortoli et al., 2012) while negatively correlating with perceived ability (Kim et al., 2011), sports confidence (Magyar & Feltz, 2003) and mindful engagement (Iwasaki & Fry, 2016).

Consistent with the correlational findings, hierarchical regressions also provided support for a pattern of task MC predicting performance improvement (Balaguer et al., 2002; 1999) and performance satisfaction overall (Balaguer et al., 2002), competition results and level of play (Balaguer et al., 1999).

Moderation analyses were conducted to look for interaction effects in 8 of the studies (Abrahamsen et al., 2008b; Bortoli et al., 2011; 2009; Buch et al., 2016; Iwasaki & Fry, 2016; Kim et al., 2011; Magyar & Feltz, 2003; Ntoumanis & Biddle, 1998). When looking at interaction terms, the two-way task DGO x ego MC interaction was found to predict pleasant psychobiosocial states (Bortoli et al., 2009) and approach coping (Kim et al., 2011). In both instances, when the perception of an ego MC was low, task DGO was positively related to psychobiosocial states and approach coping (Bortoli et al., 2009; Kim et al., 2011). In a similar way, a significant two-way interaction of ego DGO x task MC also predicted pleasant psychobiosocial states (Bortoli et al., 2009). When the perception of the task MC was low, the positive relationship between ego DGO and pleasant psychobiosocial states was stronger.

Of the three studies that tested three-way interactions pertinent to this review, Magyar and Feltz (2003) included all four combinations of task DGO, ego DGO and task and ego MC on perceived confidence. They even included a 4-way interaction of task DGO x ego DGO x task MC x ego MC. However, none of these interactions were significant in predicting perceived confidence.

Kim et al. (2011) tested the three-way interactions task DGO x ego DGO x task MC and task DGO x ego DGO x ego MC in determining psychological difficulties but found neither to be significant. The interaction task DGO x ego DGO x ego MC was also not significant in determining controllability and coping. However, the three-way task DGO x ego DGO x task MC interaction was found to be significant in predicting to feelings of controllability and coping (Kim et al., 2011). This showed that task MC had a positive relationship with controllability of stress and better coping in performance in athletes with high ego DGO and high task DGO.

Buch et al. (2016) also found significant three-way interactions of both MCs moderated by task and ego DGOs on running performance. These results showed that the positive relationships of both task and ego MCs on VO_{2max} were stronger in participants with high ego DGO and low task DGO. However, that was the only combination that rendered a positive relationship between ego MC and running performance. Task MC also had a positive effect on running performance amongst participants with high task DGO and both high and low ego DGO. The only interaction with a perceived task MC that had a negative relationship with VO_{2max} was when both task and ego DGOs were low. These DGOs point to the least motivated DGO types and these participants did not score high on the fitness test.

The evidence found in these 17 studies seems to highlight positive benefits of a task DGO and perceived task MC. Those two variables accounted for the majority of the beneficial performance optimizations that should be stressed for athletes wanting to continually have an advantage in sport. Interestingly, ego DGO seemed more similar to task DGO in terms of positive correlations, main effects and even as moderators to positive performance factors. This is unlike a perceived ego MC, which was the variable least related to positive performance factors, except for the one instance it had a positive effect on run performance when moderated by high ego DGO and low task DGO. These findings are in alignment with the AGT predictions that task DGOs and task MCs are beneficial for positive experiences and performance. The findings are also in alignment with the AGT predictions that ego DGO and ego MCs can be positive when effort is necessary, but when compared to task it is not as consistent for positive experiences and performance.

As for limitations, without every study including moderated regressions, bivariate correlational data was this review's only consistent analysis. This limits the findings by not allowing for interaction evidence of task and ego DGOs and MCs. With evidence that interactions exist, moderated regression analysis should be used when researching AGT in sport.

Of the 17 studies discussed, there was a range of athlete age and level of play. Seven of the studies used a youth athlete sample, while five used a sample of college aged young adults while three studies had a range of youth to adults in their sample and two studies did not report ages at all. The samples also ranged in level of play from recreational youth organizations, youth club, high school, intercollegiate, competitive university, and lastly elite national, international and Olympic athletes. Because of the degree of consistency in findings across the studies, this could be seen as a positive case for generalizability.

Similarly, to the range of ages and levels of play, even though DGOs and perceived MCs were all systematically in line, the array of performance variables included meant the review reported on different definitions and measurements of mental, emotional and behavioural performance outcomes and strategies. Even though all 17 studies were in alignment using the PMCSQ to measure perceived MC, this disregards the first set of AGT predictions of goal choice regarding how to manipulate MCs to convey either a task or ego atmosphere. Without this experimental manipulation, evidence is confined to results based on the same MCs being interpreted differently and subjects' data being compared to one another's instead of to their own outcomes in both MCs. A greater distinction in the results of MC prediction findings can come from MCs being induced and participants experiencing both task and ego MCs to probe this effect. Finally, all of the evidence presented is subjective in nature, except the final study that used VO_{2max} (Buch et al., 2016). With the lack of objective sport performance experiments, it is even hard to be certain how these mental and emotional variables will translate to objective sport performance.

The limitations and issues described in the introduction and in this systematic review helped to shape the following empirical research. First, Nicholls (1984) original AGT work did not view the combinations of orthogonal DGOs, instead viewing people as either task involved or ego involved. The research following his work, especially when using correlational data, has limited labels of DGO. In this way, evidence is only oriented towards task or ego DGO, without the entire picture of a person's full DGO profile. For the experiments, it was specifically sought to include the full range of the athlete's DGO profile by employing the moderated regression which some studies have used in order to measure the task DGO x ego DGO interaction's effect on performance. Second, there is also a lack of manipulated MCs in the present research, with the vast majority of research opting to measure the perceived MC with the PMCSQ instead. The experiments have purposely included MC instruction manipulation and used a mixed between and within-subjects design so that each participant (and their whole DGO profile) performs in both manipulated MCs. Third, as mentioned, there is much more psycho-social performance related evidence than objective measures of sport performance. It is hard to base true performance findings off of subjective data in that way. Because of this, the current thesis has particualry included measures of objective performance in the experiments.

Chapter 3:

Study 1 – The Relationships Between DGOs and MCs on Goal Valuation and Sport Performance in Elite Athletes

3.1 Introduction

As outlined in Chapter 1, AGT has proposed that both a person's DGO and the induced MC are responsible for a person's motivation and achievement behaviour. In general, research has shown that high task DGO is a positive asset in athletes. As has been shown throughout Chapter 1 and 2, task DGO is positively associated with a number of psychological processes associated with success and enjoyment of sport. For example, high level of task DGO is associated with higher sport satisfaction (Balaguer, Duda, & Crespo, 1999; Smith, Balaguer, & Duda, 2006), intrinsic motivation and persistent effort (Duda, 1989). In contrast, while higher task DGO has been consistently linked to positive sport related variables like sport confidence and performance coping (Machida, et al. 2012; Magyar & Feltz, 2003; Kim, et al., 2011), higher ego DGO has some mixed results. For example, athletes who have high ego DGO scores have been found to experience more performance anxiety than those who score lower in ego DGO (Hall & Kerr, 1997; Ntoumanis & Biddle, 1998; Ommundsen & Pedersen, 1999). Athletes with high ego DGO are even thought to be predisposed to the occurrence of performance anxiety (Roberts, 1986). It is therefore believed that having higher task DGO fosters better motivational, affective, and behavioural trends that are more positive and beneficial to performance than having higher ego DGO (Duda, 2001).

Further evidence shows that within training contexts, athletes who are subjected to task MC training sessions experience better psychological well-being compared to athletes subjected to ego MC training sessions, who experience anxiety and dissatisfaction (Agans, Su & Ettekal, 2018; Balaguer et al, 1999; 2002; Beck, Petrie, Harmison & Moore, 2017; Duda, 2001; Jaakkola, Ntoumanis & Liukkonen, 2016; Pensgaard & Roberts, 2000; Smith, Smoll & Cumming, 2007; Vazou et al., 2006). These studies appear to offer evidence in favour of the view that task DGO is associated with enjoyment and value in sport which is assumed to be lead to enhanced performance. However, there are a number of reasons to be cautious in accepting this conclusion.

Firstly, a key limitation is that AGT research on task and ego DGOs, as displayed in the systematic literature review in Chapter 2, relies primarily on subjective measures of sports performance, such as self-ratings of performance or questionnaires of mental and emotional sport-related concepts. This is an issue because self-ratings are subject to self-serving bias and mental and emotional sport-related concepts, although associated to sport performance, are not objective sport performance themselves.

Secondly, much of the existing research that highlights the benefits of task DGO and task MC and the negatives of ego DGO and ego MC come from experiments with youth (Bortoli et al., 2011; Bortoli et al., 2009; Bortoli et al., 2012; Cervelló et al., 2007; Hall & Kerr, 1997; Iwasaki & Fry, 2016; Magyar & Feltz, 2003; Murcia et al., 2008; Ryska et al., 1999) and recreational athletes (Ommundsen & Pedersen, 1999; Papaioannou & Kouli, 1999). It has been found that in samples of high-level competitive sport athletes, the detriment of ego DGO and MC is not necessarily as evident (Kim et al., 2011; Kuczek, 2013). This issue is addressed in the current experiment by testing a sample of adult elite athletes to see if the findings hold true for a sample of adult, highly competitive athletes.

Thirdly, a further problem within existing literature is the subjective nature of self-reports for performance variables such as mental toughness, character development, enjoyment or satisfaction (Granero-Gallegos et al., 2017; Balaguer et al., 1999; 2002; Duda, 2001; Pensgaard & Roberts, 2000; Vazou et al., 2006). Many studies also rely on self-reports to measure the perceived MCs instead of using experimental manipulations (Agans, Su & Ettekal, 2018; Balaguer et al, 1999; 2002; Beck, Petrie, Harmison & Moore, 2017; Duda, 2001; Jaakkola, Ntoumanis & Liukkonen, 2016; Pensgaard & Roberts, 2000; Smith, Smoll & Cumming, 2007; Vazou et al., 2006). In these studies, there are correlations between the participant DGOs and perceived MCs which limits the investigative nature to explore different athlete DGO profiles within different MCs.

To address these issues, the current study (Study 1) tested a sample of adult elite athletes in an objective 400-meter run experiment with manipulated task and ego MCs, to see if the past research regarding the benefits of task and negative consequences of ego will be corroborated in this sample. This study seeks to further understand the relationship between DGOs (task and ego) and manipulated MCs (task and ego instructions reinforcing the ideals of each conception of success) on performance measures in a within-subject design so every athlete performs the 400-meter run in both manipulated MCs. A subjective variable of goal valuation was also included to measure the subjective enjoyment and intended effort of each MC prior to the actual performance as this might be more in line with existing studies that measure the mental and emotional aspects of performance. Sport performance in the current experiment is indicated through two objectively measured dependent variables (run-time and peak heart rate) and a subjective variable (perceived exertion).

3.1.1 Hypotheses

Hypotheses are based on original AGT predictions (Nicholls, 1984), findings from the systematic literature review and AGT congruency perspectives discussed in Chapter 1 (Lau & Nie, 2008; Newton & Duda, 1999; Pensgaard & Roberts, 2002;). For the hypotheses, positive (or better) performance is considered shorter run-time, higher peak heart rate and higher perceived exertion.

3.1.1.1. Main Effects

Instruction (Task or Ego)

Due to original AGT predictions that favoured task involvement over ego involvement along with the systematic literature review that revealed task MC positively related to the majority of variables while ego MC negatively predicted many of the variables, it is hypothesized that task instructions will lead to higher goal valuation and better performance than ego instructions (Hypothesis 1).

Ego DGO

Athletes with high ego DGO have been found to experience performance anxiety (Hall & Kerr, 1997; Ntoumanis & Biddle, 1998; Ommundsen & Pedersen, 1999; Roberts, 1986). The consensus in reviews and intervention studies is that high task DGO fosters adaptive motivational and affective patterns that are more positive than having high ego DGO (Barkoukis, Koidou & Tsorbatzoudis, 2010; Cecchini, et al., 2014; Duda, 2001; Hassan & Morgan, 2015; Hogue et al., 2013; Mclaren et al., 2015; Nicholls et al., 2016; Smith et al., 2007; Theeboom et al., 1995). However, the systematic literature review found that ego DGO positively related to more positive than negative variables such as perceived competence and confidence (Abrahamsen et al., 2008a; 2008b; Bortoli et al., 2011; 2012; Kim et al., 2011; Magyar & Feltz, 2003; Ntoumanis & Biddle, 1998), pleasant psychobiosocial states (Bortoli et al., 2011; 2009) and to good coach assessments of performance (Cervelló et al., 2007). Given the evidence from the literature review that demonstrated the benefits of an ego DGO, it is hypothesized that ego DGO will be positively related to goal valuation and performance. Specifically, participants with high ego DGO scores will have higher goal valuation and perform better than those with low ego DGO scores (Hypothesis 2).

Task DGO

In line with original AGT predictions preferring task involvement and all supportive findings from interventions and the systematic literature review showing the most positive predictions of sport performance variables across all main effects, it is hypothesized task DGO will be positively related to goal valuation and performance. Specifically, participants with high task DGO scores will have higher goal valuation and perform better than those with low task DGO scores (Hypothesis 3).

3.1.1.2. Two-way Interactions

Ego DGO x Task DGO

According to research on full DGO goal profiles, those that are high in both DGOs are found to be the most motivated of all the different combinations of groups (Pensgaard & Roberts, 2002; Van de Pol et al., 2012). Therefore it is hypothesized that the positive relationship between task DGO and goal valuation and performance will be stronger when ego DGO is high compared to when ego DGO is low (Hypothesis 4a). Likewise, the positive relationship between ego DGO and goal valuation and performance will be stronger when task DGO is high compared to when task DGO is low (Hypothesis 4b).

Instruction (Task or Ego) x Ego DGO

Evidence of congruency, that high ego DGO matches and promotes better performance when within ego MC (Buch et al., 2016; Darnon et al., 2010; Kuczek, 2013; Roberts, 2012) led to the hypothesis that the effect of ego instruction on goal valuation and performance relative to task instruction will be stronger in those with high ego DGO scores than those with low ego DGO scores (Hypothesis 5).

Instruction (Task or Ego) x Task DGO

Similar to the previous hypothesis, evidence of congruency between task DGO and task MC and its beneficial effects on motivation and performance (Darnon et al., 2010; Standage et al., 2003) led to the hypothesis that the effect of task instruction on goal valuation and performance relative to ego instruction will be stronger in those with high task DGO scores than those with low task DGO scores (Hypothesis 6).

3.1.1.3. Three-way Interaction

Instruction (Task or Ego) x Ego DGO x Task DGO

The results that found that people with high/low DGO profiles 'fit' more congruently with MCs that match their high DGO (Buch et al., 2016; Darnon et al., 2010) led to two hypotheses. First, ego instructions will be more beneficial than task instructions on goal valuation and performance in athletes who are high in ego DGO and relatively low in task DGO (Hypothesis 7). Second, task instructions will be more beneficial than ego instructions in athletes who are high in task DGO and relatively low in ego DGO (Hypothesis 8). Evidence that those with DGO profiles that are relatively high in both benefit from task instruction more than ego instruction (Kim et al., 2011; Pensgaard & Roberts, 2002) led to this expectation (Hypothesis 9). Finally, when athletes are relatively low in both task and ego DGO, task instructions are expected to be more beneficial than ego instructions because the task instruction offers a less competitively stressful environment (Hypothesis 10).

3.2 Method

3.2.1 Design

This study used a mixed design to test the main effects and interactions of the categorical within-subject independent variable of manipulating the MC with instructions (task instruction or ego instruction) and the two between-subject independent variables of DGOs (task DGO and ego DGO) on the four dependent variables: participants' valuation of the goals, their objective performance (run-time in seconds to nearest hundredth of a second), their objective exertion (maximum heart rate during the run), and subjective exertion (perceived rating of exertion).

The within-subject variable of MC instruction allows for all participants to partake in both ego and task instruction conditions. Since the MC instructions will create different states or atmospheres, this experimental manipulation permits the comparison of how participants value and perform across both conditions compared to themselves. The between-subjects variables of ego and task DGO scores are part of the participants' innate personalities. For main effects, ego DGO scores of all participants will be compared to each other in order to explore how people with different levels of ego DGOs value and perform compared to each other. The same for task DGO scores. The interaction of ego and task DGOs allows participants' full DGO profiles to be compared to other participants' full DGO profiles to explore how these profiles value and perform compared to each other. The interaction of MCs and DGOs allow for concluding which instruction condition different DGO profiles value more and perform better in.

3.2.1.1 Pilot Study. A pilot study was conducted to ensure an order effect was not the reason for differences in running time for the within-subjects variables of MC instruction manipulation. This will allow time differences to be analysed as an outcome of experimental manipulation. Power analysis has shown the pilot studies would require 11 subjects in each group (ego climate and task climate) in order to obtain the minimum correlation of .7. Each participant ran their laps about a week apart, as the main study requires. Unlike the main study, participants ran under the same instruction each time so there was no manipulation involved, to allow for an order effect to show significance. Paired sample t-tests were used to compare time 1 to time 2 overall, in the task instruction group, and in the ego instruction group.

A paired-samples t-test was conducted to compare all participants (N=22) of both task and ego instruction conditions 400-meter running times for the first run and second run. A nonsignificant relationship was found between Time 1 (M=75.28, SD=13.69) and Time 2 (M=77.21, SD=15.19); t(21)=-1.473, p=0.156, indicating there is not an order effect across both conditions. A paired-samples t-test was then conducted to compare task instructed 400-meter running times for the first run and second run. A nonsignificant relationship was found between task instruction Time 1 (M=78.67, SD=17.74) and task instruction Time 2 (M=79.51, SD=18.85); t(10)=-.584, p=0.572, indicating there is not an order effect. A paired-samples t-test was finally conducted to compare ego instructed 400-meter running times for the first run and second run. A nonsignificant relationship was found between ego instructed Time 1 (M=71.89, SD=7.35) and ego instructed Time 2 (M=74.91, SD=10.84); t(10)=-1.36, p=0.202, also indicating there is not an order effect.

3.2.2 Participants

Participants were 140 athletes aged 18-30 years (M = 21.66, SD = 2.4; 91 male, 49 female). All athletes were elite level competitors, competing for top American Division 1 universities (N = 72), Team Durham 1st teams (N = 66) or Team GB (N = 2). These range from professional to semi-professional levels. Athletes were from a range of sports including basketball (N = 40), volleyball (N = 32), baseball (N = 26), softball (N = 21), American football (N = 15), water polo (N = 2), rowing (N = 2), surf (N = 1) and lacrosse (N = 1). Recruitment was done via emails to team's coaches or captains for approval and to set up the first meeting times.

The required sample size for this study was based on a power calculation using G*Power for a mixed ANOVA and based on the number of participants needed to have 80% power at 5% significance for post-hoc paired t-tests between the ego and task instruction conditions on any significant interaction effects. The current study was powered, based on the study conducted for the author's previous master's degree, to detect a small to medium effect size of d = 0.3 for the post-hoc paired t-tests from any significant two-way interactions and d = 0.429 from the three-way interaction.

Following the expert advice of J. Covey (personal communication, 23 January 2018), it was subsequently decided to analyse the data using a mixed model hierarchical regression rather than mixed ANOVA. This analytic approach had the advantage of not requiring the grouping of participants into high and low ego DGO groups and high and low task DGO groups for the analysis and therefore increased the sensitivity of the current analysis and statistical power.

3.2.3 Measures

3.2.3.1 Dispositional Goal Orientation (DGO). Athlete DGO was measured by the Task and Ego DGO in Sport Questionnaire (TEOSQ; Duda, 1989) (Appendix A). It is comprised of 13 "I feel successful in sport when…" statements, with 7 item endings representing mastery/task successes (e.g. "when I do my very best") and 6 item endings representing performance/ego successes (e.g. "when I score the most points/goals/hits, etc") (see Appendix A). The questionnaire uses a 5-point Likert system for participants to respond to the statements with 1- strongly disagree to 5- strongly agree. The questionnaire gives both a task and ego DGO score between 1 and 5. Ego DGO scores are calculated by adding questions 1, 3, 4, 6, 9 and 11 and dividing the total by 6 and task

DGO scores are calculated by adding questions 2, 5, 7, 8, 10, 12 and 13 and dividing the total by 7 (Duda, 1989). Previous reliability and validity tests of the TEOSQ concluded the test is useful and appropriate in deciphering motivation DGO in athletes (Duda & Whitehead, 1998). Cronbach's alpha coefficient scores for the current study demonstrated high internal consistency for the TEOSQ's ego DGO scores ($\alpha = .83$) and task DGO scores ($\alpha = .86$).

3.2.3.2 Motivational Climate (MC) Instruction. For prompting the ego MC (i.e., the ego instruction condition), the participant was shown a leader board chart of top times, see Table 17, and instructed "how high up this leader board can you come based on your current level of fitness? Set yourself someone to beat off this leader board." As ego MCs are defined as elements of social-comparison and competition (Ames, 1992), this instruction focuses the participant on the objective of referencing their goal in terms of beating others.

Table 17. Leader board for instruction in prompting ego MC.

Ranking	Men's Times	Women's Times
1	53.3	70.3
2	53.5	70.7
3	59.9	74.8
4	59.6	80.1
5	61.4	81.1
6	62.7	82.7
7	63.0	83.6
8	63.3	84.3
9	63.7	84.3
10	66.5	86.6
11	69.0	87.6
12	69.3	89.0
13	70.1	89.2
14	71.1	90.1
15	71.6	90.4
16	72.6	91.4
17	72.6	92.7
18	74.9	94.7
19	75.3	95.6
20	75.9	98.0

For promoting the task MC (i.e., the task instruction condition), the instruction was "how fast can you run based on your current level of fitness? Set yourself a good time to beat." As task MCs are defined as efforts to strive for personal bests and self-improvement (Ames, 1992), this instruction focuses the participant on setting a self-referenced goal.

3.2.3.3 Subjective Goal Value. The Subjective Task Value in Sport Questionnaire (STVSQ) is an 11-item questionnaire that was created for the study and based on subjective task value research (Eccles (Parsons), 1983; Eccles & Wigfield, 1995). The STVSQ was created with the intention to measure three subscales, (a) attainment value, (b) intended effort and confidence and (c) intrinsic interest, but was used in order to quantitatively measure the personal, subjective overall value each participant held of the goal instruction conditions they were given. The questions asked are shown in Table 18 and further details of how the questionnaire was constructed are provided in Appendix B, including the expectation of three subscales that instead all loaded onto one factor. Question 1 was a free response question, "What is your goal?" This addressed the participant's goal and allowed us to check if the MC instruction worked. These responses were coded and will be discussed more in the following section.

For questions 2-11, participants responded to each question on a Likert scale, ranging from 1-7 with 1 labeled "not at all," 4 labeled "moderately," and 7 labeled "extremely" in order to measure the value of the goal they set. Cronbach's alpha coefficient scores, seen in Table 18, for the STVSQ in both the task instruction ($\alpha = .822$) and ego instruction ($\alpha = .867$) conditions demonstrated high internal consistency. With adequate reliability, subjective task value was computed as a new variable based on the average across all 10 items.

Table 18. STVSQ Cronbach alpha scores in task and ego instruction conditions.

Task Instruction Cronbach's alpha	Question	Ego Instruction Cronbach's alpha
–	1. What is your goal? (free response answer)	–
.822	2. Please rate the value you put on this goal 3. How much do you think you will enjoy this run? 4. How happy will you be if you achieve this goal? 5. How disappointed will you be if you do not achieve this goal? 6. How important is it to you to be successful at this goal? 7. How important is it to you to not fail at this goal? 8. How hard will you try to achieve this goal? 9. How certain are you that you will achieve this goal? 10. How difficult will it be to achieve this goal? (Inverse[a]) 11. How confident are you that you will achieve this goal?	.867

Note: [a] Question #10 was reverse scored as it was a negatively worded question.

3.2.3.4 Objective Performance (Run Time). The athletic performance was measured by the time, in seconds to the hundredth, taken to run a single 400-meter lap on a standard track. The shorter the time taken to complete the lap the better the performance.

3.2.3.5 Objective Exertion (Peak Heart Rate). The Wahoo TICKR X Heart Rate Monitor was used to measure the participants' heart rate, an objective physical exertion measure. The sensor straps just below the chest and Bluetooth connects the real-time heart rate readings to the Wahoo TICKR application on the investigator's iPhone 6. Participants' peak heart rate was recorded for this measure as it gives a physiological variable of exertion. It is important to note that nearly half of the heart rate readings failed to save correctly due to connection failure between the monitor and the experimenter's iPhone; therefore, this variable has missing data, with only 71 participants recording heart rates for both ego and task instruction. Based on the original power analysis used, for two-way interactions (dividing N = 71 by 2) the available data for this measure was powered to detect an effect size at $d = 0.429$. Three-way interactions involving heart rate were especially limited (dividing N = 71 by 4), powered to detect an effect size at $d = 0.630$.

3.2.3.6 Subjective Exertion. The Borg Rating of Perceived Exertion (RPE) Scale (Borg, 2001) was used to measure subjective exertion. This scale consisted of 16-point list ranging from "no exertion at all," "very light," "somewhat hard," "very hard" to “maximal exertion” (see Appendix C). The participant is instructed to appraise their individual feelings of effort and exertion after they finished the objective performance skill and circle the statement that complies. Of the 139 participants, 118 had Borg RPE data in both the ego and task instruction conditions. Based on the original power analysis, this data would be powered to detect an effect size at $d = 0.328$ for two-way interactions and $d = .473$ for three-way interactions.

3.2.4 Procedure

The study was approved by the Psychology Department Ethics Committee at Durham University (Reference # 15/22) and insurance granted to collect data outside of the UK. Arrangements to meet with the participants for the experiment were made through the athletes’ coaches, captains or club directors. All participants gave informed consent before taking part in the experiment. Participants were told they could withdraw themselves and their data at any point of the experiment. Scheduling the second meeting time was done before the participant left the initial meeting day. The coaches and participants had the researcher’s email address if they needed to reschedule for a different day.

Each participant took part in the study on two separate occasions about one week apart ($M = 7.38$ days, $SD = 0\ .784$). The need for two testing days per participant was due to the within-subjects variable of MC instruction and the amount of physical exertion each 400-meter run requires. Athletes would not be able to run as fast as they wanted to for two separate 400-meter laps on the same day without a confounding variable of fatigue.

The first session began with the participant completing the TEOSQ, which was not scored until all data from both sessions had been collected. After the TEOSQ was completed, either the ego or the task instructions were read to induce the MC, alternating from participant to participant and noted on their questionnaire. The athlete then completed the STVSQ to measure their value of the goal. Upon completion of the questionnaire, they were accompanied to the track where they were fitted with the heart rate monitor and given free range to stretch and warm-up if desired. The participant was then reminded of the goal by it being read again. They then performed a timed 400-meter lap while wearing the heart rate monitor that was connected via Bluetooth to the researcher’s phone. Their finishing time in seconds to the nearest hundredth and peak heart rate from the monitor was recorded. They then filled out the RPE scale and 3 follow-up questions regarding how they felt about the run. From start to finish, each session took approximately 15-20 minutes.

For each participants' second session, the athlete was read whichever MC instruction they had not already received in the first session. They then filled out the STVSQ again according to the new goal. Once finished, they again were accompanied to the track, fitted with the heart rate monitor, given time to warm up and timed as they completed the 400-meter run. Time was recorded in seconds to the nearest hundredth, peak heart rate recorded, and the Borg RPE and the 3 follow-up questions were administered to end the study. Each participant was assigned a number to ensure anonymity of information obtained and recorded.

3.2.5 Data Analysis

Data was collected via paper questionnaires and input into SPSS after the participant completed both sessions of the experiment. The majority of data collected was quantitative, with one qualitative free response question, "What is your goal?," in the STVSQ that required coding. Coding was done according to descriptive language used by AGT (Duda, et al., 1995; Nicholls, 1984), as seen in Table 19, and done by two researchers to ensure proper classifications of goals as either ego, task, unspecific or unrelated. This is reported in the descriptive statistics of the next section. All other data was quantitative, from the participant's questionnaires (TEOSQ, STVSQ, Borg, and follow-up questions), along with the run-time and heart rate observations that the researcher recorded.

Table 19. Coding expressions for classifications of free response goals.

Ego goals	Task goals	Unspecific running goals	Unrelated goals
- Extrinsically motivated - Referential to others - To beat another person - To beat a specific leader board holder's time - To place at a certain position on the leader board	- Intrinsically motivated - Self-referential - To do one's best - To try hard/give effort - A generic time set for themselves - To beat their own time	- Anything unrelated to either an ego or task goal but related to running	- Unrelated to running at all

As the systematic literature review reported in Chapter 2, correlational evidence was the only consistent data analysis throughout all of the studies. In order to stay in line with past research and have results to directly compare to the existing literature, correlations were conducted and reported for the current studies as well.

As discussed previously in the power analysis section (Section 3.2.2), this study originally was based on mixed ANOVA design using median splits to create groups high or low in ego DGO and high or low in task DGOs. After expert guidance, it was decided a mixed model regression analysis would be a more appropriate way to analyse the data and avoid the need to group participants according to their ego and task DGO scores.

Mixed model procedures are able to analyze results from a range of experimental designs including two-sample designs, replacing t-tests, and repeated-measures designs, replacing repeated-measures general linear models (Hintze, 2012). Another advantage of using a mixed model is, when compared to traditional statistical methods, mixed models are more flexible and able to work despite incomplete data that is typically found in repeated-measure experimental designs (Hintze, 2012).

A moderated hierarchical multiple regression analysis was performed to determine whether the MC conditions (ego instruction and task instruction), DGOs (ego DGO and task DGO) and their interaction effects predicted goal value, run time, heart rate and perceived exertion. MC instruction was entered as an effect coded categorical variable (ego instruction was coded -1, task instruction coded +1). The decision to effect code rather than dummy code MC instruction was informed by the existence of an interaction in the model which influences the interpretation of the main effect (Grace-Martin, 2012). For example, the effect coding of ego instruction coded as -1 and task instruction coded as +1 (as opposed to being dummy coded as 0 and 1, respectively) allows for the meaningful interpretation of the value of 0 as being in between the two categories when there is an interaction (for a discussion, see Grace-Martin, 2012).

Ego DGO scores and task DGO scores were entered as continuous variables. These continuous predictor variables (ego and task DGO scores) were centered by subtracting the mean of each variable from each data point, to avoid multicollinearity and to make interpretation of the coefficients for the main effects easier (Aiken & West, 1991; Sweet & Grace-Martin, 2012). Mean centering these variables is recommended particularly with models that have interactions that include continuous and a categorical variable, especially if the continuous variables do not contain a meaningful value of 0 (Sweet & Grace-Martin, 2012).

In line with guidelines from literature (Aiken & West, 1991; Jaccard, Turrisi & Wan, 1990) significant interactions were deciphered using simple slopes analysis. To probe the significant interaction, the effect of ego/ task instruction was estimated at high (one standard deviation above the mean +1 *SD*) and low (one standard deviation below the mean -1 *SD*) values of the DGO scores.

3.3 Results

3.3.1 Descriptive Statistics

Outliers were defined as participants whose difference in run times, between their first and second run, were greater than 3 standard deviations above or below the mean difference. Using a set number of standard deviations to detect outliers is considered one of the most popular detection methods (Tabachnick & Fidell, 2012). The decision to detect and remove outliers at this level was done to account for things such as incident, injury or change of weather conditions during the week in between 400-meter runs that could have drastically impacted performance beyond the scope of the experiment. Following outlier reporting guidance (Valentine et al., 2019) based on the Open Science Framework (Open Science Collaboration, 2015), the current study believed this decision was justified and was conducted prior to further analysis in order to avoid making the decision based on biases by seeing how the removal would have impacted the findings. Reporting and being transparent about outliers are of extreme importance in regard to open science practices and the limitations of the outlier removal decision will be noted in the discussion. One outlier was identified and removed, reducing the overall sample size from 140 to 139.

Participants' average ego DGO score was $M = 3.06$ ($SD = 0.83$) and average task DGO score was $M = 4.42$ ($SD = 0.52$). Both DGO scores are based from a scale of 1-5. As seen in Table 20 and 20, means and standard deviations of all dependent variables were reported separately for the within-subjects categorical variable of ego instruction (Table 20) and task instruction (Table 21). As mentioned in the methods Section 3.2.3.5 and 3.2.3.6, caution is used for variables heart rate and perceived exertion due to incomplete data. The mean goal value score in ego instruction was $M = 4.14$ ($SD = 0.98$) while in task instruction $M = 4.25$ ($SD = 0.86$). The mean run time in ego instruction was

81.03 seconds (*SD* = 14.65) while in task instruction *M* = 83.13 seconds (*SD* = 14.47). The mean peak heart rate in ego instruction was *M* = 157.38 beats (*SD* = 23.49) while in task instruction *M* = 152.05 beats (*SD* = 23.60). Lastly, the mean perceived exertion score in ego instruction was *M* = 13.82 (*SD* = 2.27) while in task instruction *M* = 13.62 (*SD* = 2.36).

Table 20. Ego Instruction Condition - Descriptive statistics of all dependent variables.

	N	*M*	*SD*
Value	139	4.14	0.98
Run time	139	81.03	14.65
Heart rate	71	157.38	23.49
Perceived exertion	122	13.82	2.27

Table 21. Task Instruction Condition - Descriptive statistics of all dependent variables.

	N	*M*	*SD*
Value	139	4.25	0.86
Run time	139	83.13	14.47
Heart rate	74	152.05	23.60
Perceived exertion	120	13.62	2.36

For the free response question of the STVSQ, "What is your goal?," it was determined that a significant number of participants did respond with a goal congruent to the instruction they were given (refer to Section 3.2.5 for coding details). The coding of this qualitative question and a comment on the inter-rater reliability can be found in Appendix D. For the ego instruction condition, a chi-square goodness of fit test confirmed a statistically significant difference in the type of goal set ($X^2(3, N = 139) = 162.84$, $p < .001$), with the majority of participants setting ego goals ($N = 95$) followed by task goals ($N = 38$), unspecified running goals ($N = 4$) and unrelated goals ($N = 2$). For the task instruction condition, a chi-square goodness of fit test also confirmed a statistically significant difference in the type of goal set ($X^2(3, N = 139) = 186.15$, $p < .001$), with the majority of participants setting task goals ($N = 103$), followed by ego goals ($N = 25$), unspecified running goals ($N = 7$) and unrelated goals ($N = 4$).

3.3.2 Pearson Correlations

Pearson's correlations were reported separately for the within subjects categorical variable of ego instruction (Table 22) and task instruction (Table 23) and display correlations between the independent variables (ego and task DGO scores) and the dependent variables (i.e., value, run-time, heart rate and perceived exertion).

Table 22. Ego Instruction Condition - Pearson product-moment correlations of measures.

	N	Ego DGO	Task DGO	Value	Run time	Heart rate
Ego DGO	139	–				
Task DGO	139	-.07	–			
Value	139	.02	.23**	–		
Run time	139	-.31**	.17*	-.03	–	
Heart rate	71	.32**	-.05	.05	-.63**	–
Perceived exertion	122	.15	-.07	.15	-.29**	.34**

**p* < .05, ***p* < .01 (two-tailed)

Table 23. Task Instruction Condition - Pearson product-moment correlations of measures.

	N	Ego DGO	Task DGO	Value	Run time	Heart rate
Ego DGO	139	–				
Task DGO	139	-.07	–			
Value	139	-.04	.17*	–		
Run time	139	-.23**	.21*	-.06	–	
Heart rate	74	.25*	-.23*	.04	-.50**	–
Perceived exertion	120	.22*	-.08	-.04	-.38**	.39**

**p* < .05, ***p* < .01 (two-tailed)

3.3.2.1 Ego DGO. The ego DGO score was not significantly related to task DGO score (p = .415) or to value of the goal in either the ego (p = .850) or task (p = .672) instructions groups. However, ego DGO score was significantly negatively related to run-time, indicating faster run-time, and positively related to heart rate, indicating more effort exerted, in both the ego instruction (run-time: r = -.31, p < .001; heart rate: r = .32, p = .006) and task instruction (run-time: r = -.23, p = .006; heart rate: r = .25, p = .03) conditions, supporting Hypothesis 2 that ego DGO would relate to faster performance speed and more effort exerted. In line with this support of Hypothesis 2, ego DGO also positively correlated to perceived exertion in task instruction (r = .22, p = .015); however, was not significantly related to perceived exertion in ego instruction (p = .09).

3.3.2.2 Task DGO. The task DGO score significantly positively related to the value of the goal in both the ego instruction (r = .23, p = .007) and task instruction (r = .17, p = .045) conditions, which supports Hypothesis 3 that task DGO will have a positive impact on value of goals. However, task DGO positively related to run-time (slower run time) in the ego instruction (r = .17, p = .041) and task instruction (r = .21, p = .012) conditions and negatively related with heart rate in the task instruction condition (r = -.23, p = .047). This does not support Hypothesis 3, that task DGO would result in faster run time and more effort exerted, since a positive correlation with run time means a longer run time and a negative correlation to heart rate means less effort. Task DGO was not significantly related to heart rate in the ego instruction condition (p = .658) and to perceived exertion in both the ego (p = .436) and task instruction (p = .365) conditions.

3.3.2.3 Dependent Variables. In both instruction groups, value did not significantly correlate with any of the other three dependent variables (run-time, heart rate and perceived exertion). However, across both instruction groups, the two objective measures of performance and exertion (run-time & heart rate) and the subjective measure of exertion (perceived exertion) were all significantly correlated, showing that they all measured different aspects of the same common performance outcome. Run-time negatively correlated with heart rate in the ego instruction (r = -.63, p < .001) and task instruction (r = -.50, p < .001) conditions. It was also negatively correlated with perceived exertion in both the ego instruction (r = -.29, p = .001) and task instruction (r = -.38, p < .001) conditions, showing that as run-time decreased, heart rate and perceived exertion increased. Heart rate and perceived exertion were positively correlated in both the ego instruction (r = .34, p = .004) and task instruction (r = .39, p = .001) conditions, indicating as heart rate increased, perceived exertion did as well.

3.3.3 Moderated Hierarchical Multiple Regression

In a series of moderated multiple regression analyses on the dependent variables (i.e., value, run-time, heart rate and perceived exertion), see Table 24, the categorical variable of instruction was entered in step 1, with output displaying the regression coefficients according to the -1 code for ego instruction. Here, a positive coefficient would mean that the dependent variable was higher in the ego instruction condition compared to the task instruction. A negative coefficient would mean that the dependent variable was lower in the ego instruction condition compared to the task instruction.

The continuous variables of ego DGO and task DGO scores were added in step 2. A positive coefficient here would mean a positive change in the dependent variable response associated with a positive 1-unit change of the predictor, thus a positive relationship. A negative coefficient would mean a negative change in the dependent variable associated with a positive 1-unit change in the predictor, thus a negative relationship.

All possible two-way interaction terms (ego DGO x task DGO, instruction x ego DGO and instruction x task DGO) were entered in step 3. Finally, the three-way interaction term (instruction x ego DGO x task DGO) was entered in step 4. As mentioned in the data analysis, all significant interactions were then analysed using simple slope analysis.

Table 24. Study 1. Summary of moderated hierarchical regression analysis for predicting value, perceived exertion, run-time and heart rate.

	Value			Perceived Exertion		
	B	*SE*	*p*	*B*	*SE*	*p*
Step 1						
Instruction (-1)[a]	-0.11	0.07	.128	0.20	0.22	.372
Step 2						
Instruction (-1)[a]	-0.11	0.07	.128	0.20	0.22	.376
Ego DGO	0.01	0.08	.938	0.49*	0.21	.019
Task DGO	0.35**	0.13	.008	-0.23	0.33	.485
Step 3						
Instruction (-1)[a]	-0.11	0.07	.128	0.19	0.23	.393
Ego DGO	-0.02	0.09	.830	0.58*	0.25	.020
Task DGO	0.30*	0.15	.038	-0.23	0.40	.556
Ego DGO x Task DGO	-0.41**	0.14	.006	-0.46	0.37	.210
Instruction (-1)[a] x Ego DGO	0.06	0.09	.469	-0.19	0.27	.466
Instruction (-1)[a] x Task DGO	0.16	0.14	.262	0.03	0.43	.950
Step 4						
Instruction (-1)[a]	-0.12	0.07	.104	0.15	0.22	.494
Ego DGO	-0.02	0.09	.816	0.59*	0.25	.017
Task DGO	0.30*	0.15	.043	-0.24	0.40	.543
Ego DGO x Task DGO	-0.28	0.16	.085	-0.07	0.43	.879
Instruction (-1)[a] x Ego DGO	0.07	0.09	.444	-0.22	0.26	.411
Instruction (-1)[a] x Task DGO	0.17	0.14	.213	0.05	0.43	.907
Instruction (-1)[a] x Ego DGO x Task DGO	-0.25	0.16	.117	-0.78	0.46	.094

	Run-time			Heart Rate		
	B	*SE*	*p*	*B*	*SE*	*p*
Step 1						
Instruction (-1)[a]	-2.10*	0.81	.011	4.32*	2.02	.036
Step 2						
Instruction (-1)[a]	-2.10*	0.81	.011	4.32*	2.01	.035
Ego DGO	-4.50**	1.34	.001	7.86*	3.08	.013
Task DGO	4.87*	2.12	.023	-4.18	4.58	.364
Step 3						
Instruction (-1)[a]	-2.10*	0.81	.011	5.66**	2.04	.007
Ego DGO	-3.80**	1.43	.009	5.20	3.51	.142
Task DGO	5.41*	2.27	.018	-8.11	4.91	.102
Ego DGO x Task DGO	0.92	2.40	.702	-3.91	5.05	.441
Instruction (-1)[a] x Ego DGO	-1.43	0.99	.149	3.58	2.42	.143
Instruction (-1)[a] x Task DGO	-1.21	1.56	.440	7.95*	3.64	.033
Step 4						
Instruction (-1)[a]	-2.09*	0.82	.012	5.60*	2.10	.010
Ego DGO	-3.79**	1.43	.009	5.28	3.54	.140
Task DGO	5.43*	2.27	.018	-8.09	4.91	.103
Ego DGO x Task DGO	0.70	2.55	.785	-3.59	5.41	.509
Instruction (-1)[a] x Ego DGO	-1.44	0.99	.149	3.42	2.61	.195
Instruction (-1)[a] x Task DGO	-1.24	1.57	.432	7.93*	3.67	.034
Instruction (-1)[a] x Ego DGO x Task DGO	0.44	1.76	.801	-0.67	3.98	.867

[a] Ego instruction condition coded as -1; **p*<.05; ***p*<.01; ****p*<.001

As the three-way interaction in step 4 of the regression was not significant across all dependent variables, results reported in this section will be from step 3 controlling for all two-way interactions.

3.3.3.1 Instruction. There was a significant main effect of instruction for run-time and heart rate. For run-time, the negative coefficient ($b = -2.10$, $t(136) = -2.58$, $p = .01$) shows that run-time was shorter in the ego instruction condition than the task instruction condition (ego instruction $M = 81.03$ seconds, task instruction $M = 83.13$ seconds). For heart rate, the coefficient ($b = 5.66$, $t(67.70) = 2.77$, $p = .007$) shows that the ego instruction condition produced higher heart rates than the task instruction condition indicating higher effort (ego instruction $M = 157.38$, task instruction $M = 152.05$).

These findings contradict Hypothesis 1, by showing that the ego instruction condition led to better running performance and higher heart rate, thus more exertion, over the task instruction condition. The instruction main effect was not significant for goal value or perceived exertion.

3.3.3.2 Ego DGO. Ego DGO score was a significant main effect for predicting run-time and perceived exertion. For run-time, the negative coefficient (b = -3.80, t(170.62) = -2.65, p = .009) revealed that participants with higher ego DGO scores ran the lap in a shorter time, irrespective of which condition they were in.

For perceived exertion, the coefficient (b = 0.58, t(202.76) = 2.34, p = .02) showed that participants with higher ego DGO scores perceived themselves as exerting more effort across both conditions. Both of these main effects support Hypothesis 2 that stated higher ego DGO scores would result in better performance over lower ego DGO scores. Ego DGO as a main effect was not significant for goal value or heart rate.

3.3.3.3 Task DGO. Task DGO scores significantly predicted goal value and run-time. For goal value, the coefficient (b = .30, t(207.86) = 2.09, p = .038) showed that participants with higher task DGO scores valued goals across conditions higher compared to participants with lower task DGO scores, supporting hypothesis 3 that task DGO would positively predict goal value.

However, for run-time, the coefficient (b = 5.41, t(170.44) = 2.38, p = .018) revealed participants with higher task DGO scores took longer to run the lap across both conditions, contradicting Hypothesis 3 which stated higher task DGO scores would predict faster run-time compared to lower task DGO scores. Task DGO main effect was not significant for heart rate or perceived exertion, unsupportive of Hypothesis 3.

3.3.3.4 Ego DGO x Task DGO. A significant interaction was found between ego and task DGO scores (b = -0.41, t(135) = -2.82, p = .006) for goal value. Simple slope analyses showed that the effect of task DGO on goal value is significant in participants with low ego DGO scores (-1 *SD*: b = 0.64, t(173.57) = 3.29, p = .001), but is not significant in participants with high ego DGO scores (+1 *SD*: b = -0.03, t(179.71) = -0.17, p = .867). This contradicts Hypothesis 4a that the relationship between task DGO and goal value would be stronger in participants with high ego DGO scores than low ego DGO scores.

The effect of ego DGO on goal value is not significant in participants with low task DGO scores (-1 *SD*: b = 0.19, t(175.59) = 1.60, p = .111) but is borderline significant in participants with high task DGO scores (+1 *SD*: b = -0.23, t(177.53) = 1.97, p = .05).

The effect of ego DGO on goal value was negative in those with high task DGO, contradicting Hypothesis 4b, that hypothesized the effect of ego DGO would be stronger in those with high task DGO.

3.3.3.5 Instruction x Ego DGO. The effect of instruction on performance was not significantly moderated by ego DGO scores across all performance dependent variables. This does not support Hypothesis 5, which suggested that the effect of ego instruction would produce better performance for those with high ego DGO scores compared to low ego DGO scores.

3.3.3.6 Instruction x Task DGO. A significant interaction between instruction and task DGO scores was found for heart rate (b = 7.95, t(67.99) = 2.18, p = .033). Simple slopes revealed the effect of instruction on heart rate was significant in participants with high task DGO scores (+1 *SD*: b = 9.82, t(67.88) = 3.12, p = .003). This signifies that heart rate was significantly higher in the ego instruction condition compared to the task instruction condition in participants with high task DGO scores. This finding contradicts hypothesis 6, that the effect of task instruction on heart rate would be stronger in those with high task DGO scores.

Simple slopes also found that the effect of instruction on heart rate was not significant in participants with low task DGO scores (-1 *SD*: b = 1.51, t(67.76) = .63, p = .530). The instruction by task DGO interaction also was not significant for any other variables of subjective value, run time, or perceived exertion.

3.3.3.7 Instruction x Ego DGO x Task DGO. The three-way interaction in step 4 was not significant. This result does not support Hypotheses 7-10.

3.4 Discussion

The aims of Study 1 were to empirically test the relationship of AGT's DGOs and MCs, and particularly their interactions, on elements of subjective experience and performance including goal valuation, 400-meter run-time, peak heart rate and perceived exertion in elite athletes.

To start, the first set of AGT predictions of goal choice (Nicholls, 1984; i.e. that participants would adopt the goal signalled by the MC) were supported. The chi-square goodness of fit test indicated the observed distribution of type of goal set was different than the expected distribution, allowing for the conclusion that a relationship exists between the instruction given and the goal set. Inducing a MC of competition and external references related to the adoption of ego goals while inducing a neutral, self-referential MC related to the adoption of task goals.

The second set of AGT predictions (Nicholls, 1984) regard task involvement as beneficial to subjective experience, which was measured in terms of goal valuation. This prediction was partially supported. While MC instruction did not have an effect on goal valuation, the current study's findings show that participants' task DGO score predicted goal valuation. Goal valuation was positively predicted by task DGO, meaning those with higher task DGO scores valued goals more across task or ego instructions. The only interaction to be significant for goal value was ego DGO x task DGO. It was found that the effect of task DGO on goal value was positive when ego DGO scores were lower. This goes against the notion that those high in both DGOs would value and be motivated by goals more (Pensgaard & Roberts, 2002). In this context it is worth noting that this effect was true for both task-oriented goals and ego-oriented goals. It is curious why people who are high in ego DGO would not value ego-oriented goals. It is possible they know the ego goal will be physically demanding and exhausting and thus do not value the goal in terms of looking forward to it or enjoyment. However, this effect of high task DGO and low ego DGO valuing goals more does support the idea that those high in task DGO and low in ego DGO are more motivated or value goals more. Increasing task DGO and decreasing ego DGO is part of the intervention strategies found in the sport research (Barkoukis et al., 2010; Cecchini et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls et al., 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom et al., 1995). The rationale for this is typically that ego goals are bad, but what this data seem to show is that reduced ego DGO combined with higher task DGO produces the greatest valuation of goals, which might explain why these athletes are found to be the most motivated.

However, although the high task and low ego DGO combination produced the greatest goal valuation, this increased valuation was not associated with better performance in terms of run-time, or increased effort as measured by peak heart rate or perceived exertion. On first inspection this seems problematic for AGT, as most theoretical approaches assume that valuing a goal more highly will translate to increased motivation and therefore better performance. So, attention must be drawn to the finding that goal valuation did not correlate to any measures of performance in either instructed lap. This result could have occurred because goal valuation actually translates to persistence at tasks rather than performance. It could also be reflected in some other factors, such as how much athletes enjoyed achieving the goal, rather than how much effort was expended to achieve the goal.

In terms of AGT's prediction regarding performance, it was also assumed that a task MC that induced a task involved goal would be more beneficial compared to when the MC induced ego involvement. However, contrary to this assumption regarding performance, ego involvement actually resulted in positive outcomes. Specifically, ego MC instruction predicted faster run-time compared to task MC instruction. Higher ego DGO scores also predicted faster run-time compared to lower ego DGO scores. Not only did ego MC and DGO predict faster run-time, higher task DGO scores actually predicted slower run-time compared to lower task DGO scores. These effects could be due to the idea that in explosive sprinting tasks the goal is very immediate and will require not just effort but also pain. This is seemingly at odds with the idea that a task goal will make the performance more enjoyable. Perhaps there is something about the 'here-and-now' nature of a sprint that makes it more amenable to ego-oriented goals.

The key findings from the moderated regression analysis were largely from main effects rather than the hypothesized interactions of congruency. These findings include (a) higher task DGO scores, along with higher task DGO scores moderated by lower ego DGO scores, predicted the positive subjective experience of goal valuation. This is in line with the literature that emphasizes task DGO over ego DGO as having more positive motivational effects (Duda, 2001). However, the key findings continue with (b) the ego instruction condition led to better objective performance than the task instruction condition, in terms of running faster and obtaining higher peak heart rates, regardless of DGO scores and (c) higher ego DGO scores negatively predicted run time (running faster) while higher task DGO scores positively predicted run time (running slower) across both instruction conditions. These results are quite unexpected. To start, in contrast to the objective performance data, the self-report subjective goal valuation data showed that participants intended to try harder in the task instructed climate. However, this finding is in line with previous literature that highlights the positive atmosphere that task climates seem to induce. This inconsistency between subjective value and intended effort to the actual physical performance is difficult to understand. It is here that the distinction between enjoyment and pain comes into play while doing exertion-based sprints. It does suggest that self-report data may need to be treated with caution if athletes feel they are supposed to report that they intend to try harder with task instructions.

These results also suggest against the majority of AGT sport literature, indicating instead that ego instructed MCs and higher levels of ego DGO are optimal for sports performance. Even more so, that high levels of task DGO might even be suboptimal for objective sports performance. Regarding the ego MC and higher ego DGO scores predicting faster run times, this could be down to the sample population including elite athletes who are used to the highly competitive ego MCs and also potentially score higher in ego DGO (Hardy et al., 1996; Kim et al., 2011; Kuczek, 2013; Weinberg et al., 1993) compared to physical education students, youth or even recreational athletes.

However, before drawing any strong conclusions from these data it is important to consider some limitations. First, the sessions took place outdoors and spaced by ~ 7 days, so some factors like weather might have influenced the data simply by adding noise to the data. Second, there is an observer effect since the athlete knows they are being timed and watched by the experimenter. This perhaps makes the ego MC more salient than the task MC. Social facilitation findings will be further discussed in the general discussion. Thirdly, the current study's sample of elite athletes is a specific subgroup of athletes. Much of AGT's emphasis on promoting task DGO and task MC is with youth and recreational sport (Barkoukis et al., 2010; Cecchini et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls et al., 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom et al., 1995), research specific to adult elite and highly competitive athletes has called for this not to be considered the norm (Hardy, Jones & Gould, 1996; Kuczek, 2013). Instead, research with elite athletes has argued they can benefit from ego DGOs and MCs, not only because high-level sport is inherently competitive and in line with ego involvement, but also because at elite levels, athletes will have already experienced and thrived under these ego DGOs and MCs (Hardy et al., 1996; Kuczek, 2013; Weinberg et al., 1993). Harwood and Swain (2000) have even discussed the distinction between recreational and elite athletics, suggesting task involvement can only be applied to recreational sport where the innate premise is centred on leisure instead of competition and ego involvement is far more a part of competitive, high-level sport. However, from the systematic literature review, many of the studies used a sample of elite or high-level competitive university athletes (Abrahamsen et al., 2008a; Balaguer et al., 2002; Kim et al., 2011; Kristiansen et al., 2008; Machida et al., 2012; Ntoumanis & Biddle, 1998; Ntoumanis et al., 1999; Pensgaard, 1999) and while the general consensus was that ego DGO had more positive than negative outcomes, ego MC was the variable that was associated with the most adverse outcomes. This could dispute the notion that ego DGO is harmful for athletes and further exploration is needed to understand why ego MC has been shown to have negative consequences in some studies, but positive performance outcomes in objective performance studies. This study may also not have found adverse outcomes of ego DGO and MC because it did not measure specifically for adverse results such as anxiety or confidence. Beyond the ego results, these studies also found these elite and high-level athletes to have positive outcomes with task DGO and task MC as well, in line with the notion that task DGO and MC are positive assets to athletes. The following experiment is an extension of the current experimental paradigm to a different sample of recreational athletes.

Chapter 4:

Study 2 - The Relationships between DGOs and MCs on Goal Valuation and Sport Performance in Recreational Athletes

4.1 Introduction

The findings from Study 1 suggest that sports performances are optimized in ego-instructed MCs and at higher levels of ego DGOs. These results contrast from the general findings of the AGT literature on the benefits of task DGOs and MCs, however it is important to note that a majority of the existing literature that examines task and ego DGOs, task/mastery and ego/performance MC was conducted with youth and recreational athletes (e.g., Bortoli et al., 2011; Ommundsen & Pedersen 1999). Since Study 1 was conducted using a participant sample of elite level competitive athletes, it is necessary to further examine the generalizability of these findings. Study 2 sought to further examine the unexpected findings of Study 1 and improve its generalizability through the inclusion of recreational-level athletes.

4.1.1 Hypotheses

The rationale and hypotheses for the current study (Study 2) are the same as the previous study. The entire study is conducted the same way except for the change in population sample. Again, better performance is considered faster run-time, higher peak heart rate and higher perceived exertion.

4.1.1.1. Main Effect Hypotheses

Due to original AGT predictions that favoured task involvement over ego involvement along with the systematic literature review that revealed task MC positively related to the majority of variables while ego MC negatively predicted many of the variables, it is hypothesized that task instructions will lead to more goal valuation and better performance than ego instructions (Hypothesis 1).

Although not the consensus in many reviews and interventions, the systematic literature review found that ego DGO actually positively related to more positive than negative variables. With this evidence showing the positive side of ego DGO, it is hypothesized that ego DGO will be positively related to goal valuation and performance.

Specifically, participants with high ego DGO scores will have more goal value and perform better than those with low ego DGO scores (Hypothesis 2).

In line with original AGT predictions preferring task involvement and all supportive findings from the systematic literature review showing the most positive predictions of sport performance variables across all main effects, it is hypothesized task DGO will be positively related to performance. Specifically, participants with high task DGO scores will hold more goal value and perform better than those with low task DGO scores (Hypothesis 3).

4.1.1.2. All Two-way Interaction Hypotheses

Ego DGO x Task DGO

According to research on full DGO goal profiles, those that are high in both DGOs are found to be the most motivated of all the different combinations of groups (Pensgaard & Roberts, 2002; Van de Pol et al., 2012), therefore it is hypothesized that the positive relationship between task DGO and performance will be stronger when ego DGO is high compared to when ego DGO is low (Hypothesis 4a). Likewise, the positive relationship between ego DGO and goal value and performance will be stronger when task DGO is high compared to when task DGO is low (Hypothesis 4b).

Instruction (Task or Ego) x Ego DGO

Evidence of congruency, that high ego DGO matches and promotes better performance when within ego MC (Buch et al., 2016; Darnon et al., 2010; Kuczek, 2013; Roberts, 2012) led to the hypothesis that the effect of ego instruction on goal value and performance relative to task instruction will be stronger in those with high ego DGO scores than those with low ego DGO scores (Hypothesis 5).

Instruction (Task or Ego) x Task DGO

Similar to the previous hypothesis, evidence of congruency between task DGO and task MC and its beneficial effects on motivation and performance (Darnon et al., 2010; Standage et al., 2003) led to the hypothesis that the effect of task instruction on goal value and performance relative to ego instruction will be stronger in those with high task DGO scores than those with low task DGO scores (Hypothesis 6).

4.1.1.3. Three-way Interaction

Instruction (Task or Ego) x Ego DGO x Task DGO.

The results that found that people with high/low DGO profiles 'fit' more congruently with MCs that match their high DGO (Buch et al., 2016; Darnon et al., 2010) led to 2 hypotheses. First, the extent to which ego instructions rather than task instructions are beneficial might only be evident in athletes who are high in ego DGO and relatively low in task DGO (Hypothesis 7). Second, task instructions will be more beneficial in athletes who are high in task DGO and relatively low in ego DGO (Hypothesis 8). Evidence that those with DGO profiles that are relatively high in both benefit from task instruction more than ego instruction (Kim et al., 2011; Pensgaard & Roberts, 2002) led to this expectation (Hypothesis 9). Finally, when athletes are relatively low in both task and ego DGO, task instructions are expected to be more beneficial than ego instructions because the task instruction offers a less competitively stressful environment (hypothesis 10).

4.2 Method

4.2.1 Design

Study 2 used the same mixed design as Study 1 to test the effects and interactions of the categorical within-subject independent variable of manipulating the MC with instructions (ego instruction and task instruction) and the two between-subject independent variables of DGOs (ego DGO and task DGO) on the four dependent variables: participants' valuation of the goals, their objective performance (run-time in seconds to nearest hundredth of a second), their objective exertion (maximum heart rate during the run), and subjective exertion (perceived rating of exertion).

The within-subject variable of MC instruction allows for all participants to partake in both ego and task instruction conditions. Since the MC instructions will create different states or atmospheres, this experimental manipulation permits the comparison of how participants value and perform across both conditions compared to themselves.

The between-subjects variables of ego and task DGO scores are part of the participants' innate personalities. For main effects, ego DGO scores of all participants will be compared to each other in order to explore how people with different levels of ego DGOs value and perform compared to each other. The same for task DGO scores. The interaction of ego and task DGOs allows participants' full DGO profiles to be compared to other participants' full DGO profiles to explore how these profiles value and perform compared to each other. The interaction of MCs and DGOs allow for concluding which instruction condition different DGO profiles value more and perform better in.

4.2.2 Participants

Participants for Study 2 were 140 recreational athletes aged 18-68 years (M = 25.21, SD = 9.62; 70 male, 70 female). They were recruited from seven recreational sports clubs, including a runner's club (N = 21), Zumba class members (N = 5), UFC gym members (N = 18) and a range of intramural sports members including basketball (N = 43), volleyball (N = 27), football (N = 20), and ultimate frisbee (N = 6). Recruitment was done via the class or recreational team leaders and gym organizers. The power and sample size information are as stated in Section 3.2.2 from the previous study. Of these seven recreational sport clubs, the Zumba club is the only club that does not offer any competitions. The running club, UFC gym and intramural sport clubs all have an element of competitions available to the members, albeit at a recreational level. This will be discussed in the discussion as a potential limitation.

4.2.3 Measures

As this study was a replica of Study 1 with a different sample, all of the same measures were used again and in the same ways.

4.2.3.1 Dispositional Goal Orientation (DGO). Athlete DGO was measured by the TEOSQ (Duda, 1989) (Appendix A), providing athletes with an ego DGO score and a task DGO score. Refer back to Section 3.2.3.1 for further information on the items and scoring calculations. Cronbach's alpha coefficient scores for the current study demonstrated good internal consistency for the TEOSQ's ego DGO scores (α = .80) and task DGO scores (α = .82).

4.2.3.2 Motivational Climate (MC) Instruction. The same instructions and leader board were given as the last study. For the ego MC instruction (i.e., the ego instruction condition), a leader board was shown of top times and the participant was asked "how high up this leader board can you come based on your current level of fitness? Set yourself someone to beat off this leader board." For the task MC instruction (i.e., the task instruction condition), participants were told "how fast can you run based on your current level of fitness? Set yourself a good time to beat." For the rationale of the instructions and the ego instruction condition leader board, refer back to Section 3.2.3.2.

4.2.3.3 Subjective Goal Value. The subjective value of the two MC instructions was measured by the STVSQ, the questionnaire created by the authors used originally in Study 1. For further details of the construction and scoring of the questionnaire refer to Appendix B. Question loadings and scoring are the same as section 3.2.3.3, providing an overall subjective value score in each condition. Cronbach's alpha coefficient scores for the STVSQ in both the ego instruction (α = .846) and task instruction (α = .826) conditions proved high internal consistency.

4.2.3.4 Objective Performance (Run Time). The athletic performance skill was again measured by the time, in seconds, taken to run a single 400-meter lap on a standard track.

4.2.3.5 Objective Exertion (Peak Heart Rate). The Wahoo TICKR X Heart Rate Monitor was used to measure the participants' heart rate, an objective physical exertion measure. Due to the missing data from Study 1, before starting this study the experimenter made changes to where the phone was in relation to the monitor to ensure proper and complete registration and saving of the data.

4.2.3.6 Subjective Exertion. The RPE Scale (Borg, 2001) was used to measure subjective exertion (See Appendix C).

4.2.4 Procedure

The study was approved by the Psychology Department Ethics Committee and insurance granted to collect data outside of the UK (Reference # 16/22). Arrangements to meet with the participants for the experiment were made through the intramural sport leaders and the sport class/club directors. All participants gave informed consent before taking part in the experiment. Participants were told they could withdraw themselves and their data at any point of the experiment. Scheduling the second meeting time was done before the participant left the initial meeting day. Participants had the researcher's email address if they needed to reschedule for a different day.

Each participant took part in the study on two separate occasions about 1 week apart (M = 7.72 days, SD = 1.31). As in Study 1, the need for two testing days per participant was due to the within-subjects variable of MC instruction and the amount of physical exertion each 400-meter run requires. Athletes would not be able to run as fast as they wanted to for two separate 400-meter laps on the same day without a confounding variable of fatigue.

The same procedure from Study 1 was followed. The first session began with the participant completing the TEOSQ, which was not scored until all data from both sessions had been collected. After the TEOSQ was completed, either the ego or the task instructions were read to induce the MC, alternating from participant to participant and noted on their questionnaire. The participant then completed the STVSQ to measure their value of the goal. Upon completion of the questionnaire, they were accompanied to the track where they were fitted with the heart rate monitor and given free range to stretch and warm-up if desired. The participant was then reminded of the goal by it being read again. They then performed a timed 400-meter lap while wearing the heart rate monitor that was connected via Bluetooth to the researcher's phone. Their finishing time in seconds to the nearest hundredth and peak heart rate from the monitor was recorded. They then filled out the RPE scale and 3 follow-up questions regarding how they felt about the run. From start to finish, each session took approximately 15-20 minutes.

For the second session, the participant was read whichever MC instruction they had not already received in the first session. They then filled out the STVSQ again according to the new goal. Once finished, they again were accompanied to the track, fitted with the heart rate monitor, given time to warm up and timed as they completed the 400-meter run. Time was recorded in seconds to the nearest hundredth, peak heart rate recorded, and the Borg RPE and the 3 follow-up questions were administered to end the study. Each participant was assigned a number to ensure anonymity of information obtained and recorded.

4.2.5 Data Analysis

The data analysis for this study follows that of Study 1, found in Section 3.2.5. Data was collected and coded in the same ways. As previously described, descriptives, correlations, and a mixed model regression with simple slope analysis were used to interpret the data.

The moderated hierarchical multiple regression analysis was performed to determine whether the MC conditions (ego instruction and task instruction), DGOs (ego DGO and task DGO) and their interaction effects predicted goal value, run time, heart rate and perceived exertion. Simple slope analysis (using high and low levels of the DGO scores in the regression) allow for the significant interactions to be deciphered. Refer to section 3.2.5 for the justification and input details of the chosen analysis.

4.3 Results

4.3.1 Descriptive Statistics

Outliers were defined as participants whose difference in run times, between their run 1 and run 2, were greater than 3 standard deviations above the mean. As in the study before, this was done to account for things such as incident, injury or change of weather conditions during the week in between that could have drastically impacted performance beyond the scope of the experiment. Please refer back to section 3.3.1 for a full justification of this decision in light of open science practices (Nosek, 2015; Open Science Collaboration, 2015). Two outliers were found and removed, reducing sample size from 140 to 138. Participants' average ego DGO score was $M = 2.88$ ($SD = 0.83$) and average task DGO score was $M = 4.25$ ($SD = 0.61$).

As seen in Table 25 and 25, means and standard deviations of all dependent variables were reported separately for the within-subjects categorical variable of ego instruction (Table 25) and task instruction (Table 26). The average goal value score in the ego instruction was $M = 4.29$ ($SD = 0.91$), while in the task instruction $M = 4.94$ (SD

= 0.88). The average run time in the ego instruction was *M* = 82.49 seconds (*SD* = 19.10), and in the task instruction *M* = 84.96 seconds (*SD* = 19.34). Average peak heart rate in the ego instruction was *M* = 156.83 beats (*SD* = 17.03), while in the task instruction *M* = 152.03 beats (*SD* = 18.63). Lastly, the average perceived exertion score in the ego instruction was *M* = 15.65 (*SD* = 2.38), and in the task instruction *M* = 14.69 (*SD* = 2.50).

Table 25. Ego Instruction Condition - Descriptive statistics of all dependent variables.

	N	*M*	*SD*
Value	138	4.29	0.91
Run time	138	82.49	19.10
Heart rate	138	156.83	17.03
Perceived exertion	137	15.65	2.38

Table 26. Task Instruction Condition - Descriptive statistics of all dependent variables.

	N	*M*	*SD*
Value	138	4.94	0.88
Run time	138	84.96	19.34
Heart rate	138	152.03	18.63
Perceived exertion	138	14.69	2.50

For the free response question of the STVSQ, "What is your goal?," it was determined that a significant amount of participants did respond with a goal congruent to the instruction they were given (for coding details reference Section 3.2.5). The coding of this qualitative question and a comment on the inter-rater reliability can be found in Appendix E. For the ego instruction condition, a chi-square goodness of fit test confirmed a statistically significant difference in the type of goal set ($X^2(3, N = 138) = 218.290, p < .001$), with the majority of participants setting ego goals (*N* = 107) followed by task goals (*N* = 29), unspecified running goals (*N* = 1) and unrelated goals (*N* = 1). For the task instruction condition, a chi-square goodness of fit test also confirmed a statistically significant difference in the type of goal set ($X^2(3, N = 138) = 136.73, p < .001$), with the majority of participants setting task goals (*N* = 91), followed by ego goals (*N* = 32), unspecified running goals (*N* = 13) and unrelated goals (*N* = 2).

4.3.2 Pearson Correlations

Tables 26 and 27 display correlations between the independent variables of ego and task DGO scores and the dependent variables of value, run-time, heart rate and perceived exertion.

Table 27. Ego Instruction - Pearson product-moment correlations of measures.

	Ego DGO	Task DGO	Value	Run time	Heart rate
Ego DGO	–				
Task DGO	.08	–			
Value	.17	.12	–		
Run time	-.21*	-.08	-.21*	–	
Heart rate	.04	.16	.12	-.45**	–
Perceived exertion	.25**	.03	.11	-.36**	.43**

*$p < .05$, **$p < .01$ (two-tailed)

Table 28. Task Instruction - Pearson product-moment correlations of measures.

	Ego DGO	Task DGO	Value	Run time	Heart rate
Ego DGO	–				
Task DGO	.08	–			
Value	-.14	.22*	–		
Run time	-.20*	-.12	-.06	–	
Heart rate	.03	.23**	.02	-.55**	–
Perceived exertion	.08	.12	-.00	-.33**	.41**

*$p < .05$, **$p < .01$ (two-tailed)

4.3.2.1 Ego DGO. The ego DGO score was not significantly related to task DGO score (p = .345) or to value of the goal in either the ego (p = .053) or task (p = .109) instructions groups. However, ego DGO score was significantly negatively related to run-time, indicating faster run-time, in both ego (r = -.21, p = .013) and task (r = -.20, p = .019) conditions, supportive of Hypothesis 2 that ego DGO would be positively related to performance. Ego DGO was not significantly related to heart rate in either ego (p = .620) or task (p = .691) instruction. Lastly, ego DGO was not significantly correlated to perceived exertion in the task instruction (p = .332) but was significant in the ego instruction (r = .25, p = .004), showing that within the ego instructed MC, ego DGO scores had a positive relationship to perceiving more exertion, also in support of Hypothesis 2.

4.3.2.2 Task DGO. The task DGO score was not significant in relation to value of the goal for the ego condition (p = .156) but was significantly related to value of the goal for the task condition (r = .27, p = .011), in support of Hypothesis 3 which hypothesized task DGO would be positively related to goal value. Task DGO was unrelated to run-time in both the ego instruction (p = .334) and task instruction (p = .160) conditions. Whereas task DGO was unrelated to heart rate in the ego condition (p = .070), it was significantly related to heart rate in the task condition (r = .23, p = .008), showing that task DGO scores had a positive relationship to heart rate, an indicator of effort, only in the task instruction, also in support of Hypothesis 3. Task DGO was unrelated to perceived exertion across both ego (p = .759) and task (p = .168) instruction conditions.

4.3.2.3 Dependent Variables. The dependent variable of value only was significantly related to run-time in the ego condition (r = -.21, p = .012), indicating that those in the ego instruction condition who valued the goal higher had a faster run-time. Besides that correlation, goal value was unrelated to run-time in the task condition (p = .491), unrelated to heart rate in ego instruction (p = .154) and task instruction (p = .825) and unrelated to perceived exertion in ego instruction (p = .217) and task instruction (p = .977). Across both instruction groups, the 2 objective measures of performance and exertion (run-time & heart rate) and the subjective measure of exertion (perceived exertion) were all significantly correlated the same. Run-time negatively correlated with heart rate in ego (r = -.45, p < .001) and task (r = -.55, p < .001) as well as negatively correlated with perceived exertion in both ego (r = -.36, p < .001) and task (r = -.33, p < .001) conditions, showing that as run-time decreased, heart rate and perceived exertion increased. Heart rate and perceived exertion were positively correlated in both ego (r = .43, p < .001) and task (r = .41, p < .001) conditions, indicating as heart rate increased, perceived exertion did as well.

4.3.3 Moderated Hierarchical Multiple Regression

As in Study 1, a moderated hierarchical multiple regression analysis was performed to determine whether MC instructions (ego and task), DGOs (ego and task) and the DGOs moderation of MC instructions predicted changes to goal value, 400-meter run time, heart rate and perceived exertion. Again, MC instruction was entered as a categorical variable, coded as -1 for ego instruction and 1 for task instruction, and ego

DGO scores and task DGO scores were entered as continuous variables. The continuous predictor variables (task and ego DGO scores) were centred by subtracting the mean of each variable from each data point to avoid multicollinearity (Aiken & West, 1991).

In the same way as the study prior, a series of moderated multiple regression analyses, see Table 29, the categorical variable of instruction was entered in step 1 to test main effects on all dependent variables (i.e., value, run-time, heart rate and perceived exertion), with output displaying the regression steps according to the -1 code for ego instruction. The continuous variables of ego DGO and task DGO scores were added in step 2 to also test main effects on all dependent variables. All possible two-way interaction terms (ego DGO scores x task DGO scores, instruction x ego DGO and instruction x task DGO) were entered in step 3 as moderated predictors of the dependent variables.

Simple slopes were then used to decipher significant moderation interactions by estimating the effect of ego/ task instruction at high (one standard deviation above the mean +1 *SD*) and low (one standard deviation below the mean -1 *SD*) values of the DGO scores (Aiken & West, 1991; Jaccard, Turrisi & Wan, 1990).

Table 29. Study 2. Summary of moderated hierarchical regression analysis for predicting value, perceived exertion, run time and heart rate.

	Value			Perceived Exertion		
	B	*SE*	*p*	*B*	*SE*	*p*
Step 1						
Instruction (-1)[a]	-0.65***	0.06	.000	0.95***	0.13	.000
Step 2						
Instruction (-1)[a]	-0.65***	0.06	.000	0.95***	0.13	.000
Ego DGO	0.00	0.08	.965	0.46	0.46	.055
Task DGO	0.25*	0.11	.033	0.27	0.27	.409
Step 3						
Instruction (-1)[a]	-0.65***	0.06	.000	0.95***	0.12	.000
Ego DGO	-0.17	0.09	.073	0.31	0.25	.230
Task DGO	0.33**	0.12	.008	0.42	0.34	.216
Ego DGO x Task DGO	0.02	0.14	.868	-0.55	0.39	.159
Instruction (-1)[a] x Ego DGO	0.33***	0.07	.000	0.48**	0.15	.002
Instruction (-1)[a] x Task DGO	-0.17	0.09	.074	-0.42*	0.21	.045
Step 4						
Instruction (-1)[a]	-0.65***	0.06	.000	0.94***	0.12	.000
Ego DGO	-0.16	0.09	.079	0.33	0.25	.195
Task DGO	0.33**	0.12	.009	0.41	0.34	.229
Ego DGO x Task DGO	0.01	0.15	.972	-0.72	0.41	.079
Instruction (-1)[a] x Ego DGO	0.33***	0.07	.000	0.42**	0.15	.006
Instruction (-1)[a] x Task DGO	-0.16	0.09	.080	-0.39	0.21	.071
Instruction (-1)[a] x Ego DGO x Task DGO	0.04	0.11	.751	0.35	0.25	.162

	Run-time			Heart Rate		
	B	*SE*	*p*	*B*	*SE*	*p*
Step 1						
Instruction (-1)[a]	-2.47***	0.36	.000	4.80***	0.73	.000
Step 2						
Instruction (-1)[a]	-2.47***	0.36	.000	4.80***	0.73	.000
Ego DGO	-4.57*	1.93	.019	0.49	1.76	.782
Task DGO	-2.71	2.65	.308	5.57*	2.42	.023
Step 3						
Instruction (-1)[a]	-2.47***	0.36	.000	4.80***	0.72	.000
Ego DGO	-4.91*	2.00	.015	0.20	1.87	.915
Task DGO	-3.11	2.68	.247	6.96**	2.51	.006
Ego DGO x Task DGO	3.18	3.18	.320	1.06	2.92	.717
Instruction (-1)[a] x Ego DGO	-0.27	0.43	.528	0.26	0.87	.764
Instruction (-1)[a] x Task DGO	1.26*	0.59	.036	-2.61*	1.19	.030
Step 4						
Instruction (-1)[a]	-2.40***	0.35	.000	4.68***	0.71	.000
Ego DGO	-5.05*	2.00	.013	0.44	1.87	.816
Task DGO	-3.05	2.67	.257	6.84**	2.50	.007
Ego DGO x Task DGO	4.06	3.20	.207	-0.52	3.00	.862
Instruction (-1)[a] x Ego DGO	-0.01	0.44	.986	-0.21	0.88	.809
Instruction (-1)[a] x Task DGO	1.13	0.59	.056	-2.39*	1.18	.045
Instruction (-1)[a] x Ego DGO x Task DGO	-1.77*	0.70	.013	3.16	1.41	.027

[a] Ego instruction coded as -1; *p<.05; **p<.01; ***p<.001

As there was a significant three-way interaction from Step 4, all results are reported from this step in the analysis.

4.3.3.1 Instruction. There was a significant main effect of instruction for all four of the dependent variables: value, run-time, heart rate and perceived exertion. For goal value, the negative coefficient (b = -0.65, t(134) = -11.51, p < .001) shows that value was lower in the ego instruction condition than the task instruction condition (ego instruction value M = 4.29, task instruction value M = 4.94), supportive of hypothesis 1 that task instructions would lead to more goal value compared to ego instruction.

However, for run-time, the negative coefficient (b =−2.40, t(134) = -6.80, p < .001) reveals that run-time was shorter, thus faster, in the ego instruction condition than the task instruction condition (ego instruction M = 82.49 seconds, task instruction M = 84.96 seconds). For heart rate, the positive coefficient (b = 4.68, t(134) = 6.58, p < .001) shows that heart rate reached higher peak rates in the ego instruction condition than the task instruction condition (ego instruction M = 156.83 peak heart rate, task instruction M = 152.03 peak heart rate). For perceived exertion, the positive coefficient (b = 0.94, t(133.32) = 7.65, p < .001) shows that participants perceived their exertion as higher in the ego instruction condition than the task instruction condition (ego instruction M = 15.65, task instruction M = 14.69). These results contradict Hypothesis 1, which hypothesized that task MC instructions would lead to better performance than ego instructions.

4.3.3.2 Ego DGO. There was a significant main effect of ego DGO score for run-time. The negative coefficient (b = -5.05, $t(137.24)$ = -2.52, p = .013) reveals that participants with higher ego DGO scores ran the lap in a shorter time, irrespective of which condition they were in, compared to those with lower ego DGO scores. This finding supports Hypothesis 2 that ego DGO would be positively related to running performance. Ego DGO as a main effect was not significant for goal value, heart rate or perceived exertion.

4.3.3.3 Task DGO. There was a significant main effect of task DGO scores on goal value and heart rate. For goal value, the positive coefficient (b = .33, $t(176.49)$ = 2.65, p = .009) revealed that participants with higher task DGO scores valued goals across conditions higher compared to participants with lower task DGO scores.

For heart rate, the positive coefficient (b = 6.84, $t(149.68)$ = 2.73, p = .007) revealed that participants with higher task DGO scores had higher peak heart rates compared to participants with lower task DGO scores. Both of these results are in support of Hypothesis 3 that task DGO would be positively related to goal valuation and exertion in terms of peak heart rate. Task DGO was not statistically significant as a main effect for run time or perceived exertion.

4.3.3.4 Ego DGO x Task DGO. The interaction of ego DGO scores x task DGO scores was not significant for any of the dependent variables, not in support of Hypothesis 4a or 4b that stated higher task and ego DGOs will moderate each other to have a strong positive effect on performance.

4.3.3.5 Instruction x Ego DGO. A significant interaction between instruction and ego DGO scores was found for goal value (b = 0.33, $t(134)$ = 4.73, p < .001) and perceived exertion (b = 0.42, $t(133.36)$ = 2.77, p = .006). For goal value, simple slope analysis found that the effect of instruction on value was significant in participants with both high

(+1 *SD*: $b = -0.37$, $t(135) = -4.63$, $p < .001$) and low (-1 *SD*: $b = -0.92$, $t(135) = -11.67$, $p < .001$) ego DGO scores. This signified that ego instruction had a negative effect on goal value in participants with higher and lower ego DGO scores, though the participants with lower ego DGO scores' coefficient was larger. This alternatively also implied that task instruction had a positive effect on value in participants with higher and lower ego DGO scores. This contradicted Hypothesis 5 that hypothesized that higher ego DGO scores would moderate the positive effect of ego instruction on goal value.

For perceived exertion, simple slopes found that the effect of instruction on perceived exertion was significant in participants with both higher (+1 *SD*: $b = 1.35$, $t(134.36) = 7.75$, $p < .001$) and lower (-1 *SD*: $b = 0.56$, $t(134.10) = 3.23$, $p = .002$) ego DGO scores. This showed that ego instruction had a positive effect on perceived exertion in participants with lower and higher ego DGO scores, though the participants with higher ego DGO scores moderation was stronger. This also showed that task instruction had a negative effect on perceived exertion in participants with lower and higher ego DGO scores. This supports Hypothesis 5 that the effect of ego instruction on performance will be stronger in those with higher ego DGO scores.

4.3.3.6 Instruction x Task DGO. A significant interaction between instruction and task DGO scores was found for heart rate ($b = -2.39$, $t(134) = -2.03$, $p = .045$). Simple slopes revealed that the effect of instruction on heart rate was significant in participants with higher task DGO scores (+1 *SD*: $b = 3.22$, $t(135) = 3.16$, $p = .002$) along with participants with lower task DGO scores (-1 *SD*: $b = 6.39$, $t(135) = 6.27$, $p < .001$). The signified that ego instruction had a positive effect on heart rate, thus more effort given, in participants with higher and lower task DGO scores, though the relationship was stronger in participants with lower task DGO scores. This also showed that task instruction had a negative effect on heart rate, thus less effort given, in participants with higher and lower task DGO scores, which contradicts hypothesis 6 that hypothesized higher task DGO scores would moderate the positive effect of task instruction on peak heart rate.

4.3.3.7 Instruction x Ego DGO x Task DGO. The three-way interaction between instruction, ego DGO score and task DGO score was found to be significant for run-time ($b = -1.77$, $t(134) = -2.53$, $p = .013$) and heart rate ($b = 3.16$, $t(134) = 2.24$, $p = .027$). For the simple slope analysis of the three-way interaction, all four combinations of high (+1 *SD*) and low (-1 *SD*) scores were tested in the regression.

For run-time, the simple slope analysis revealed that the effect of instruction on run-time was not significant in participants with low ego DGO and high task DGO (b = -0.82, $t(134) = -1.20$, $p = .233$), thus not in support of Hypothesis 8. However, the effect of instruction on run-time was significant in all other combinations of ego and task DGO.

This analysis showed that participants with high ego DGO scores and low task DGO scores ran significantly faster in the ego goal instruction than in the task goal instruction, in support of Hypothesis 7 ($b = -2.20$, $t(134) = -2.74$, $p = .007$). The same effect is true for participants high in both task and ego DGO, running faster in ego instruction than in task instruction, contrary to Hypothesis 9 ($b = -2.61$, $t(134) = -4.01$, $p < .001$). Those low in both ego and task DGO scores had the largest difference though, running the ego instructed lap almost four seconds faster on average compared to their task instructed lap, which was also contrary to Hypothesis 10 ($b = -3.97$, $t(134) = -5.62$, $p < .001$).

Similarly, for heart rate, simple slopes also showed that the effect of instruction on heart rate was not significant in participants with low ego DGO and high task DGO, not in support of Hypothesis 8 ($b = 1.82$, $t(134) = 1.33$, $p = .188$).

Also like the previous simple slope results, the effect of instruction on heart rate was again significant in all other combinations of ego and task DGO.

The simple slopes analysis revealed significant higher heart rates, thus more effort exerted, in the ego goal instruction than in the task goal instruction, in participants with high ego DGO scores and low task DGO in support of Hypothesis 7 ($b = 4.35$, $t(134) = 2.69$, $p = .008$). The same effect is true for participants high in both task and ego DGO, having a higher peak heart rate in the ego instruction lap than in task instruction, contrary to Hypothesis 9 ($b = 4.64$, $t(134) = 3.54$, $p = .001$). Those low in both task and ego DGO scores had the largest difference though, with an average peak heart rate in the ego instructed lap almost 8 beats per minute more than compared to their task instructed lap ($b = 7.89$, $t(134) = 5.55$, $p < .001$). This finding was contrary to Hypothesis 10 that assumed those least motivated participants would perform better in the less competitive task instruction. The three-way interaction was not significant for goal value and perceived exertion.

4.4 Discussion

The aims of Study 2 were to extend the experimental paradigm of Study 1 to a sample of recreational athletes. Thus, the aims were to empirically test the relationship of AGT's DGOs and MCs, and particularly their interactions, on elements of subjective experience and performance including goal valuation, 400-meter run-time, peak heart rate and perceived exertion in recreational athletes.

The first set of AGT predictions of goal choice (Nicholls, 1984) were supported with the chi-square goodness of fit test confirming the task and ego MC manipulation led people to setting more goals consistent with the instruction. This was also consistent with the findings from Study 1.

The second set of AGT predictions was that task involvement is better than ego involvement for more positive subjective experience, measured in the current study through goal valuation. This was supported by task MC instructions predicting more goal valuation compared to ego MC instructions along with task DGO positively predicting more goal valuation across both instructions. This finding was consistent with the sample of elite athletes from Study 1 and the current sample of recreational athletes. Both studies found that athletes' task DGO scores predicted goal valuation while ego DGO scores were insignificant. Interestingly, for the current study, the two-way interaction of MC instruction x ego DGO revealed that ego MC instruction negatively predicted goal valuation in participants with both high and low ego scores. This interaction stresses the AGT prediction that ego involvement (ego MC x ego DGO) is not conducive to positive subjective experience by way of valuing goals and also is counter to the congruency hypothesis that assumed those high in ego DGO would value goals within an ego MC.

However, AGT's predictions of performance being better in task involvement were not supported, instead showing positive performance outcomes of ego involvement. The three performance variables of run-time, peak heart rate and perceived exertion all were significantly correlated with each other. The MC instruction effect for run-time and heart rate was opposite of goal value. While participants valued task MC instructed goals more, participants ran faster in ego MC instructions and slower for task MC instructions. The findings that the ego instructed MC predicted faster 400-meter running times over the task instructed MC most clearly contrasts with the evidence from the VO_{2max} treadmill experiment (Buch,et al., 2016) and the youth 1-mile run in their physical education class (Xiang, et al., 2004), which both found task MC to relate to better run performance.

Although all results are from running performance experiments, the current 400-meter runs averaged between 1 minute and 21 seconds to 1 minute and 24 seconds while the VO_{2max} treadmill experiment consisted of a 20-minute running warmup followed by a more intense 4-7 run until exhaustion and the youth 1-mile average was 11 minutes and 7 seconds. Without many objective performance variables in the research, it is possible that short exertion-based performances do actually benefit from ego MCs.

Ego DGO also predicted faster run-times, meaning those with higher ego DGOs scores ran fasters than those with lower ego DGO scores. Participants also had higher peak heart rates and more perceived exertion in the ego MC condition than the task MC condition, indicating more effort in ego MCs. In regard to perceived exertion, an interesting two-way interaction of instruction x ego DGO was found that also is contrary to the goal valuation findings. While ego MC instruction negatively predicted goal value in participants with both high and low ego DGO, the same interaction positively predicted perceived exertion. This means that ego involvement (ego MC x ego DGO) has negative outcomes on the subjective experience of valuing the goal, but it has positive outcomes on how much effort participants believe they gave to the goal once it was over. While these findings were contrary to AGT's predictions of performance, the findings were consistent with those from Study 1. This indicates while elite and recreational athletes' task DGOs and task MCs predict more goal valuation over ego DGOs and MCs, the athletes actually objectively perform better and perceive giving more effort in ego MCs and with higher ego DGO scores.

The final result related to the objective performances of run-time and peak heart rate was a significant three-way interaction of instruction x ego DGO x task DGO. It was found that ego instructions produced faster run times, but this depended on the level of task and ego DGO. Ego instructions were most effective when people scored low on both task and ego DGO, roughly similarly effective when people were high on ego and task DGO, or high on ego DGO but low on task DGO. The instruction had no effect on performance when the people were high on task DGO but low on ego DGO. The same pattern was shown for heart rate. Ego MC instruction producing faster run-time and higher heart rates was as hypothesized for the participants who are high in ego DGO and low in task DGO. From the limited congruency research within AGT (Buch et al., 2016; Darnon et al., 2010; Roberts, 2012; Standage et al., 2003), this is expected since the high DGO is congruent with the MC, thus athletes are in an atmosphere that most matches their innate tendencies and allows for peak performance to flow more naturally.

However, this congruency effect did not hold for the task MC instruction with the athletes who are high in task DGO and low in ego DGO. Further, for the groups of athletes who are low in both DGOS or high in both DGOS, it was hypothesized that task MC instruction would be more effective for performance as the majority of research points to task MC continuously being more effective than ego MC when 'head to head' (Barkoukis et al., 2010; Cecchini et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls et al., 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom et al., 1995). But this was not the case, with ego MC instruction being the more effective instruction for run-time and peak heart rate in these groups as well.

The aim of this study was to examine how motivational climate interacted with achievement orientation to affect performance in recreational runners. The regression revealed that that ego instructions produced faster run times, but this depended on the level of task and ego DGO. Ego instructions were most effective when people scored low on both task and ego DGO, roughly similarly effective when people were high on ego and task DGO, or high on ego DGO but low on task DGO. The instruction had no effect on performance when the people were high on task DGO but low on ego DGO. The same pattern was shown for heartrate. Ego MC instruction producing faster run-time and higher heart rates was as hypothesized for the participants who are high in ego DGO and low in task DGO. From the limited congruency research within AGT (Buch et al., 2016), this is expected since the high DGO is congruent with the MC, thus athletes are in an atmosphere that most matches their innate tendencies and allows for peak performance to flow more naturally. However, this congruency effect did not hold for the task MC instruction with the athletes who are high in task DGO and low in ego DGO as hypothesized. Further, for the groups of athletes who are low in both DGOS or high in both DGOS, it was hypothesized that task MC instruction would be more effective for performance as the majority of research points to task MC being more effective than ego MC when 'head to head'. But this was not the case, with ego MC instruction being the more effective instruction for run-time and peak heart rate in these groups as well.

With these themes arising of task involvement connected to more subjective goal value and ego involvement connected to better objective performance, perhaps instead of focusing on the sample of athletes the focus should move to the type of athletic performance. The sample of athletes must also be discussed as a limitation. While the distinction between elite and recreational athletes from Study 1 to Study 2 was made based on competition level, within this current recreational sample, the Zumba class members do not participate in competitions at all compared to the other club members that do. With Zumba members only accounting for five of the total participants, this element of competition could be a reason the athletes across Study 1 and Study 2 had similar results. Perhaps, rather than drawing a distinction between elite, high-competitive level athletes and recreational athletes (Hardy et al., 1996; Harwood & Swain, 2000; Kuczek, 2013; Weinberg et al., 1993), an avenue to further explore this paradigm in is a different type of sport performance. In the previous study and the current one, the two objective measures of performance saw significant main effects of MC instruction, with ego MC instruction leading to faster run times and higher effort displayed by heart rate. It begs the question of what sport *performance* is in the literature… a subjective level value and intention, or an objective physical enactment of exertion and skill?

Ego involvement, specifically ego MC, has been shown to increase performance anxiety (Abrahamsen et al., 2008a; 2008b; Hall & Kerr, 1997; Kim et al., 2011; Ntoumanis & Biddle, 1998; Ommundsen & Pedersen, 1999). It is also possible that this study may not have found adverse outcomes of ego DGO and MC because it did not measure specifically for adverse results such as anxiety or confidence, which will be added to the following study. An explanation for the positive objective performance outcomes in ego involvement could be that this somatic anxiety, commonly displayed by increased blood pressure and heart rate (Martens et al., 1990b), can be interpreted by athletes as arousal or psyching up which is actually beneficial to exertion performances (Burton, 1988; Hammoudi-Nassib, Nassib, Chtara, Briki, Chaouachi, Tod & Chamari, 2017). A major question is would it be the same in performances that require athletic skill in terms of fine motor control without any exertion in terms of strength, speed or endurance, where concentration and fine executions are needed. While experiments manipulating ergogenic effect via caffeine for sprinters have found no negative effect on heart rate or sprint performance (Astorino, Matera, Basinger, Evans, Schurman & Marquez, 2011), other experiments measuring somatic anxiety via heart rate for specific skills such as shooting free throws has found negative effects on performance accuracy (Oudejans & Pijpers, 2009). Basketball free throw shooting is a complex sport-specific skill (Hillyer, Menon & Singh, 2015). A widely tested basketball-specific performance measure is free throw shots (e.g., Baker et al., 2007; Englert & Bertrams, 2012; Lidor, 2004; Oudejans & Pijpers, 2010; Shaabani et al., 2020) in which successful free throws are the objective performance measures. Free throws are a closed loop, self-paced skill that is reliant on coordination and fine motor control from 15-ft away from the basket. It therefore offers an ideal model for examining the effects of MC on the performance of a sport skill, as opposed to its effects on speed endurance.

A final issue is around the meaningfulness of the task-oriented instructions. Can you have a learning/mastery experience when running really quickly? The next experiment, using basketball free throws as the objective performance measures, will be much easier to conceptualise in terms of valuable practice, mastery of technique and concentration on doing ones' best.

Chapter 5:

Study 3 - The Relationships between DGOs and MCs on Goal Valuation and Sport Performance in Shooting Basketball Free Throws

5.1 Introduction

Study 2 expanded upon Study 1 by including recreational level athletes into its analysis of objective sports performance as measured by the running paradigm. The results of Study 2 further supported the findings of Study 1 in that ego DGOs and MCs optimized performance on the running task. This result warrants the question: could increased heart rate (measured as objective exertion) as a function of anxiety be conducive to the running task in particular and provide an advantage in ego DGO/MC conditions? The second important driver of this experiment was to use a skill that has some meaning in terms of practice and future gains.

To answer this, a change in objective sports performance is necessary. Study 3 therefore uses basketball free throw shooting as a skill-based objective sports performance in which anxiety might hinder performance in order to further examine the optimization of sports performance. Additionally, a subjective anxiety questionnaire is included in order to measure if the ego or task instructions are actually inducing anxiety as questioned.

5.1.1 Hypotheses

The rationale and hypotheses for the current study are the same as the previous two studies, mainly because the hypotheses are based on the systematic literature review and past research. Even though the past two studies have contradicted many of the hypotheses, they will be kept in place because this current study seeks to examine the research questions one final time with a new performance dependent variable. Study 1 results with the elite athlete sample performing significantly better under ego instruction and ego DGO over task instruction and task DGO was surprising. Study 2 sought to see if the same results held true with a sample of recreational athletes. Again, the significantly better performance in ego instruction and ego DGO over task instruction and task DGO was unexpected. Rationalizing the findings led to the belief that perhaps the increased performance in ego settings was not, in fact, due to the sample, but instead due to the type of performance: exertion. Perhaps the negative outcomes of an ego MC on performance shown in the systematic literature review does not hold true when the only objective is to run fast. The current study was conducted very similarly as the previous two studies, except for the change in objective performance and measures of anxiety. To understand if the findings from Study 1 and Study 2 can be generalized to other types of performance, for this Study 3, the objective performance is skill-based basketball free throw shooting.

Anxiety and confidence measures were also added to test if the negative trends around competition anxiety found in the literature applied to skill-based performance where anxiety could be detrimental. The anxiety measures from the CSAI-2R (explained further below in the methods section) gives scores of cognitive anxiety, somatic anxiety and self-confidence. These items will be referred to as 'subjective experience,' the term Nicholls (1984) used in the original AGT description to make hypotheses related to mental and emotional experiences of AGT. For these hypotheses, better subjective experience is considered less somatic anxiety, less cognitive anxiety, more self-confidence. Better performance is considered more basketball free throws made. The following 10 hypotheses are similar as the previous studies, with slightly different justification to match the dependent variables.

Although the results from the previous experiments did not support many of the hypotheses, with the new objective performance measure being skill-based, it is hypothesized the original AGT predictions will fit this study more accurately.

5.1.1.1. Main Effect Hypotheses

Due to original AGT predictions that favoured task involvement over ego involvement along with the systematic literature review that revealed task MC positively related to the majority of variables while ego MC negatively predicted many of the variables, it is hypothesized that task instructions will lead to more goal valuation, better subjective experiences and better performance than ego instructions (Hypothesis 1).

The systematic literature review found that ego DGO was positively related to more positive than negative variables. With this evidence showing the positive side of ego DGO, it is hypothesized that ego DGO will be positively related to goal valuation, subjective experiences and performance. Specifically, participants with high ego DGO scores will have higher goal valuations, will report more positive subjective experiences and perform better than those with low ego DGO scores (Hypothesis 2).

In line with original AGT predictions preferring task involvement and all supportive findings from the systematic literature review showing the most positive predictions of sport performance variables across all main effects, it is hypothesized task DGO will be positively related to goal value, subjective experience and performance. Specifically, participants with high task DGO scores will have more goal value, positive subjective experience and perform better than those with low task DGO scores (Hypothesis 3).

5.1.1.2. All Two-way Interaction Hypotheses

Ego DGO x Task DGO

According to research on full DGO goal profiles, those that are high in both DGOs are found to be the most motivated of all the different combinations of groups (Pensgaard & Roberts, 2002; van de Pol et al., 2012, therefore it is hypothesized that the positive relationship between task DGO and goal value, subjective experiences and performance will be stronger when ego DGO is high compared to when ego DGO is low (Hypothesis 4a). Likewise, the positive relationship between ego DGO and goal value, subjective experiences and performance will be stronger when task DGO is high compared to when task DGO is low (Hypothesis 4b).

Instruction (Task or Ego) x Ego DGO

Evidence of congruency, that high ego DGO matches and promotes better performance when within ego MC (Buch et al., 2016; Darnon et al., 2010; Kuczek, 2013; Roberts, 2012) led to the hypothesis that the effect of ego instruction on goal value, subjective experiences and performance relative to task instruction will be stronger in those with high ego DGO scores than those with low ego DGO scores (Hypothesis 5).

Instruction (Task or Ego) x Task DGO

Similar to the previous hypothesis, evidence of congruency between task DGO and task MC and its beneficial effects on motivation and performance (Darnon et al., 2010; Standage et al., 2003) led to the hypothesis that the effect of task instruction on goal value, subjective experiences and performance relative to ego instruction will be stronger in those with high task DGO scores than those with low task DGO scores (Hypothesis 6).

5.1.1.3. Three-way Interaction

Instruction (Task or Ego) x Ego DGO x Task DGO.

The results that found that people with high/low DGO profiles 'fit' more congruently with MCs that match their high DGO (Buch et al., 2016; Darnon et al., 2010) led to 2 hypotheses. First, the extent to which ego instructions rather than task instructions are beneficial might only be evident in athletes who are high in ego DGO and relatively low in task DGO (Hypothesis 7). Second, task instructions will be more beneficial in athletes who are high in task DGO and relatively low in ego DGO (Hypothesis 8). Evidence that those with DGO profiles that are relatively high in both benefit from task instruction more than ego instruction (Kim et al., 2011; Pensgaard & Roberts, 2002) led to this expectation (Hypothesis 9). Finally, when athletes are relatively low in both task and ego DGO, task instructions are expected to be more beneficial than ego instructions because the task instruction offers a less competitively stressful environment (Hypothesis 10).

5.2 Method

5.2.1 Design

Like the previous two studies, this study used a mixed model regression design, discussed in Section 3.2.1. This design was used to test the effects and interactions of the categorical within-subject independent variable of manipulating the MC with instructions (ego instruction and task instruction) and the two between-subject independent variables of DGOs (task DGO and ego DGO) on the dependent variables. The dependent variables of this study differ to the two previous studies in the performance task and questionnaires used. The participants' valuation of the goals was kept the same, but the objective performance was now basketball free throws and a new subjective measure was a questionnaire that measured somatic anxiety, cognitive anxiety and self-confidence. The new measures will be discussed further in the following Section 5.2.3.

The within-subject variable of MC instruction allows for all participants to partake in both ego and task instruction conditions. Since the MC instructions will create different states or atmospheres, this experimental manipulation permits the comparison of how participants value and perform across both conditions compared to themselves. The between-subjects variables of ego and task DGO scores are part of the participants' innate personalities. For main effects, ego DGO scores of all participants will be compared to each other in order to explore how people with different levels of ego DGOs value and perform compared to each other. The same for task DGO scores. The interaction of ego and task DGOs allows participants' full DGO profiles to be compared to other participants' full DGO profiles to explore how these profiles value and perform compared to each other. The interaction of MCs and DGOs allow for concluding which instruction condition different DGO profiles value more and perform better in.

5.2.2 Participants

Participants were 154 basketball players from all levels (college and university 1^{st}, 2^{nd} and 3^{rd} teams) aged 18-27 (M = 21.26, SD = 2.30). The sample consisted of 76 males, 77 females and 1 'prefer not to say'. Power analysis rationale is as discussed in Section 3.2.2., meeting the requirement of N = 138 for a small to medium effect size.

5.2.3 Measures

5.2.3.1 Dispositional Goal Orientation (DGO). In line with the previous two studies, athlete DGO was measured by the TEOSQ (Duda, 1989) (Appendix A). For scoring and further validity and reliability information, refer back to Section 3.2.3. Cronbach's alpha coefficient scores for the current study demonstrated high internal consistency for the TEOSQ's ego DGO scores (α = .85) and task DGO scores (α = .84).

5.2.3.2 Motivational Climate (MC) Instruction. For prompting the ego MC (i.e., the ego instruction condition), the participant was shown a leader board chart of top free throw makes, see Table 30, and instructed "how high up this leaders board can you come based on your ability? Please focus on how many free throws you can make." As stated before in Section 3.2.3.2, ego MCs are defined as elements of social-comparison and competition (Ames, 1992), thus this instruction focuses the participant on the objective of referencing their goal in term of comparing oneself to and beating others.

Table 30. Leader board chart of top free throw makes.

Free Throw Leader Board
1. 14/15
2. 12/15
3. 11/15
4. 10/15
5. 8/15
6. 7/15

For prompting the task MC (i.e., the task instruction condition), the instruction given was "do your best with the free throws. Please focus on good technique and consistent form." As previously stated in Section 3.2.3.2, task MCs are defined as efforts to strive for personal bests and self-improvement (Ames, 1992), thus this instruction focuses the participant on themselves and self-referential goals.

5.2.3.3 Subjective Goal Value. The STVSQ from the previous studies was again used for the current study to measure the personal subjective value the participants held of the goal instruction conditions they were given. For further details of the construction and scoring of the questionnaire refer to Section 3.2.3.3 and Appendix B.

The STVSQ question 1, the coded free response question ("What is your goal?"), will be addressed in the following section. For questions 2-11, Cronbach's alpha coefficient scores in both the ego instruction (α = .81) and task instruction (α = .75) conditions demonstrated high internal consistency. With adequate reliability, subjective goal value was computed as a new variable of the average across all 10 items.

5.2.3.4 Subjective Anxiety. The Competitive State Anxiety Inventory-2 Revised (CSAI-2R; Cox, Martens & Russell, 2003) is a 17-item questionnaire that was used to measure participants' level of current anxiety symptoms (see Appendix F). The CSAI-2R was revised from the CSAI-2, a 27-item, sport-specific self-report measure of anxiety developed by Martens, Vealey and Burton (1990). In validating the CSAI-2R, Cox and colleagues (2003) used confirmatory factor analysis to first revise the CSAI-2 factor structure and then to validate the revised version. Confirmatory factor analysis of the CSAI-2 calibration sample resulted in a poor fit to the data, and items that loaded on multiple factors were deleted. The revised CSAI-2R resulted in the current 17-items and confirmatory factor analysis found it was a good fit of the data. It is thus suggested that the CSAI-2R be used by researchers to measure athlete competitive state anxiety (Cox, Martens & Russell, 2003).

The CSAI-2R produces scores for three sub-scales: somatic anxiety, cognitive anxiety and self-confidence. The subscales are scored by adding the scores of the specific subscale items, dividing that number by the number of items in the subscale and then multiplying that number by 10. All subscales will give a score between 10-40. Somatic anxiety is scored by adding items 1, 4, 6, 9, 12, 15 and 17, dividing the total by 7, and then multiplying the number by 10. Cognitive anxiety is scored by adding items 2, 5, 8, 11 and 14, dividing the total by 5, and multiplying that total by 10. Self-confidence is scored by adding items 3, 7, 10, 13 and 16, dividing the total by 5, and multiplying that total by 10. Cronbach's alpha coefficients, seen in Table 31, for the CSAI-2R subscales of somatic anxiety, cognitive anxiety and self-confidence, in both the ego instruction and task instruction conditions demonstrated adequate internal consistency. The subscales were computed as one variable score via the scoring directions mentioned.

Table 31. CSAI-2R subscales Cronbach's Alpha coefficients for ego and task instruction conditions.

Ego Instruction Cronbach's Alpha	**CSAI-2R**	Task Instruction Cronbach's Alpha
	Somatic Anxiety Subscale	
.80	1. I feel jittery 4. My body feels tense. 6. I feel tense in my stomach. 9. My heart is racing. 12. I feel my stomach sinking. 15. My hands are clammy. 17. My body feels tight.	.70
	Cognitive Anxiety Subscale	
.81	2. I am concerned that I may not do as well in this competition as I could. 5. I am concerned about losing. 8. I am concerned about choking under pressure. 11. I'm concerned about performing poorly. 14. I'm concerned that others will be disappointed with my performance.	.76
	Self-Confidence Subscale	
.90	3. I feel self-confident. 7. I'm confident I can meet the challenge. 10. I'm confident about performing well. 13. I'm confident because I mentally picture myself reaching my goal. 16. I'm confident of coming through under pressure.	.84

5.2.3.5 Objective Performance (Free Throws Made). The skill-based athletic performance was measured by the number of basketball free throw shots made, out of 15 shots taken.

5.2.4 Procedure

The study was approved by the Psychology Department Ethics Committee at Durham University (REF: PSYCH-2019-04-23). The participants were recruited via colleges and basketball clubs at the University. If participants brought a teammate with them to participate, they received a £10 amazon gift card. All participants gave informed consent before taking part in the experiment. Participants were told they could withdraw themselves and their data at any point of the experiment.

The study was conducted fully in one setting. Unlike the previous two studies, the current study's performance variable was not exertion based, so fatigue was not a concern. To start the experiment, after the participant information sheet was read and consent form signed, the participants completed the TEOSQ, which measured participant task and ego DGO. After the TEOSQ was completed, either the ego or the task instruction was read to them to induce the MC, alternating from participant to participant, and noted on their questionnaire. The athlete then completed the STVSQ to measure their value of the goal instruction given. Upon completion of the questionnaire they then completed the CSAI-2R to measure their current anxiety symptoms and self-confidence. They then were given time to stretch and/or warm up if desired and then given a basketball (a mens size 7 basketball and womens size 6 basketball were both provided) and allowed to take up to 5 warm up shots. The participant then performed their 15 basketball free throw shots and the number of makes were recorded by the experimenter. After the shots were finished, they were given time to rest and then read the alternative task or ego instruction which they had not received yet. They then filled out the STVSQ and CSAI-2R again to measure their value, anxiety and self-confidence in the current condition instruction. From here the participant then completed their final 15 basketball free throw shots. From start to finish, each participant took approximately 15-20 minutes to complete the study.

5.2.5 Data Analysis

Data was collected via paper questionnaires and input into SPSS after the experiment. The majority of data collected was quantitative, with one qualitative free response question, "What is your goal?," in the STVSQ that required coding. Consistent with the last two experiments, coding was done according to descriptive language used by AGT (Duda, et al., 1995; Nicholls, 1984), as seen in Table 32, and done by two researchers to ensure proper classifications of goals as either ego, task, unspecific or unrelated. This is reported in the descriptive statistics in the next section.

Table 32. Coding expressions for classifications of free response goals.

Ego goals	Task goals	Unspecific running goals	Unrelated goals
- To place at a certain position on the leader board - To beat a specific leader board holder's number of free throws made - Extrinsically motivated - Referential to others - To beat another person	- Focus on one's form or consistency - Intrinsically motivated - Self-referential - To do one's best - To try hard/give effort - To better their own best	- Anything unrelated to either an ego or task goal but related to free throws	- Unrelated to free throws at all

All other data was quantitative, from the participant's questionnaires (TEOSQ, STVSQ and CSAI-2R), along with number of basketball free throws made.

The power analysis information and decision for that data analysis are all consistent with that explained in Study 1 (Sections 3.2.2 and 3.2.5). Beyond descriptive and correlational data, a moderated hierarchical multiple regression analysis was performed to determine whether the MC conditions (ego instruction and task instruction), DGOs (ego DGO and task DGO) and their interaction effects predicted goal value, somatic anxiety, cognitive anxiety, self-confidence and free throws made. MC instruction was entered as an effect coded categorical variable (ego instruction was coded -1, task instruction coded +1). Ego DGO scores and task DGO scores were entered as continuous variables. These continuous predictor variables (ego and task DGO scores) were centered by subtracting the mean of each variable from each data point, to avoid multicollinearity and to make interpretation of the coefficients for the main effects easier (Aiken & West, 1991; Sweet & Grace-Martin, 2010). Centering these variables is recommended particularly with models that have interactions that include continuous and a categorical variable, especially if the continuous variables do not contain a meaningful value of 0 (Sweet & Grace-Martin, 2010).

As in Studies 1 and 2 before and in line with guidelines from literature (Aiken & West, 1991; Jaccard, Turrisi & Wan, 1990) significant interactions were deciphered using simple slopes analysis. To probe the significant interaction, the effect of ego/ task instruction was estimated at high (one standard deviation above the mean +1 *SD*) and low (one standard deviation below the mean -1 *SD*) values of the DGO scores. Through this analysis, main effects, all two-way interactions and the three-way interaction are tested.

5.3 Results

5.3.1 Descriptive Statistics

All subjects were included (N = 154) as no outliers (+/- 3 *SD*) were found between ego instruction free throws made and task instruction free throws made. In light of open science practices (Nosek, 2015; Open Science Collaboration, 2015), this outlier decision will be discussed in the limitation section in the concluding chapter. Participants' average ego DGO score was M = 3.05 (*SD* = 0.84) and average task DGO score was M = 4.16 (*SD* = 0.60). As seen in Table 33 and 33, means and standard deviations of all dependent variables were reported separately for the ego instruction (Table 33) and task instruction (Table 34) conditions. The mean goal value score in the ego instruction condition was M = 4.90 (*SD* = 0.78) while in the task instruction condition M = 4.97 (*SD* = 0.71). The mean somatic anxiety score in ego instruction was M = 13.74 (*SD* = 4.37) while in task instruction M = 13.40 (*SD* = 3.45). The mean cognitive anxiety score in ego instruction was M = 19.01 (*SD* = 6.51) while in task instruction M = 17.65 (*SD* = 5.65). The mean self-confidence score in ego instruction was M = 27.05 (*SD* = 7.31) while in task instruction M = 27.99 (*SD* = 6.37). Lastly, the mean free throws made in ego instruction was M = 9.82 (*SD* = 3.31) while in task instruction M = 10.03 (*SD* = 2.89).

Table 33. Ego Instruction Condition - Descriptive statistics of all dependent variables.

	N	*M*	*SD*
Value	154	4.90	0.78
Somatic Anxiety	154	13.74	4.37
Cognitive Anxiety	154	19.01	6.51
Self-Confidence	154	27.05	7.31
Free Throws Made	154	9.82	3.31

Table 34. Task Instruction Condition - Descriptive statistics of all dependent variables.

	N	*M*	*SD*
Value	154	4.97	0.71
Somatic Anxiety	154	13.40	3.45
Cognitive Anxiety	154	17.65	5.65
Self-Confidence	154	27.99	6.37
Free Throws Made	154	10.03	2.89

For the free response question of the STVSQ, "What is your goal?," it was determined that a significant amount of participants did respond with a goal congruent to the instruction they were given. The coding of this qualitative question and a comment on the inter-rater reliability can be found in Appendix G. For the ego instruction condition, a chi-square goodness of fit test confirmed a statistically significant difference in the type of goal set ($X^2(2, N = 154) = 147.91$, $p < .001$), with the majority of participants setting ego goals ($N = 121$) followed by task goals ($N = 29$), unspecified free throw goals ($N = 4$). For the task instruction condition, a chi-square goodness of fit test also confirmed a statistically significant difference in the type of goal set ($X^2(1, N = 154) = 72.96$, $p < .001$), with the majority of participants setting task goals ($N = 130$), followed by ego goals ($N = 24$). No order effect was detected with 66 participants taking part in the ego goal instruction first and 88 participants taking part in the task goal instruction first, $t(307) = 1.32$, $p = .187$.

5.3.2 Pearson Correlations

Pearson's correlations were reported separately for the within subjects categorical variable of ego instruction (Table 35) and task instruction (Table 36) and display correlations between the independent variables (ego and task DGO scores) and the dependent variables (i.e., value, somatic anxiety, cognitive anxiety, self-confidence and free throws made).

Table 35. Ego Instruction Condition - Pearson product-moment correlations of measures.

	Ego DGO	Task DGO	Value	Somatic anxiety	Cognitive anxiety	Self-confidence
Ego DGO	—					
Task DGO	-.09	—				
Goal Value	-.12	.49**	—			
Somatic anxiety	-.01	-.22**	-.11	—		
Cognitive anxiety	.01	-.23**	-.12	.65**	—	
Self-confidence	-.13	.40**	.59**	-.33**	-.50**	—
Free throws made	-.20*	-.04	.17*	-.22**	-.28**	.25**

*$p < .05$, **$p < .01$ (two-tailed)

Table 36. Task Instruction Condition - Pearson product-moment correlations of measures.

	Ego DGO	Task DGO	Value	Somatic anxiety	Cognitive anxiety	Self-confidence
Ego DGO	—					
Task DGO	-.09	—				
Goal Value	-.23**	.42**	—			
Somatic anxiety	-.00	-.31**	-.16	—		
Cognitive anxiety	.15	-.32**	-.07	.50**	—	
Self-confidence	-.21**	.39**	.46**	-.25**	-.56**	—
Free throws made	-.22**	.03	.12	-.06	-.18*	.27**

*$p < .05$, **$p < .01$ (two-tailed)

5.3.2.1 Ego DGO. Ego DGO score was not related to task DGO score ($p = .25$). Ego DGO was not correlated to goal value in the ego instruction condition ($p = .13$); however, in the task instruction condition, ego DGO was significantly negatively correlated to goal value ($p = .005$). Ego DGO was not significantly related to somatic anxiety in either instruction condition (ego instruction: $p = .94$; task instruction: $p = .98$). Similarly, ego DGO was also not significantly related to cognitive anxiety in either instruction condition (ego instruction: $p = .89$; task instruction: $p = .07$). While ego DGO was not correlated to self-confidence in the ego instruction ($p = .12$), it was negatively correlated to self-confidence in the task instruction (p = .008). In both instruction conditions, ego DGO was negatively related to made free throws (ego instruction: p = .012; task instruction: p = .007). All of these significant negative correlations are contrary to Hypothesis 2 that stated ego DGO would be positively associated with better performance.

5.3.2.2 Task DGO. For task and ego instructions Task DGO was found to be significantly related to every dependent variable except free throws made (ego instruction: p = .60; task instruction: p = .69). Task DGO was positively related to goal value (ego instruction: $p < .001$; task instruction: $p < .001$) and self-confidence (ego instruction: $p < .001$; task instruction: $p < .001$) while negatively related to somatic (ego instruction: p = .006; task instruction: $p < .001$) and cognitive anxiety (ego instruction: p = .004; task instruction: $p < .001$). All of these correlations support Hypothesis 3 that task DGO would be positively related to better performance.

5.3.2.3 Dependent Variables. Goal value was positively related to self-confidence ($p < .001$) and free throws made (p = .034) in the ego instruction condition, while only positively related to self-confidence ($p < .001$) in the task instruction. Across both conditions, the subscales of the CSAI-2R were significantly correlated to each other, with somatic anxiety being positively related to cognitive anxiety (ego instruction: $p < .001$; task instruction: $p < .001$) and negatively related to self-confidence (ego instruction: $p < .001$; task instruction: p = .002). In the ego instruction only, somatic anxiety was negatively related to free throws made (p = .006). Cognitive anxiety was also negatively related to self-confidence in both conditions (ego instruction: $p < .001$; task instruction: $p < .001$). Cognitive anxiety was also negatively related to free throws made in both ego and task instruction conditions (ego instruction: $p < .001$; task instruction: p = .024). Lastly, self-confidence was found to be positively correlated to free throws made in both conditions (ego instruction: p = .001; task instruction: p = .001).

5.3.3 Moderated Hierarchical Multiple Regression

In a series of moderated multiple regression analyses, see Table 37, the categorical variable of instruction was entered in step 1 to test main effects on all dependent variables (i.e., value, run-time, heart rate and perceived exertion), with output displaying the regression coefficients according to the -1 code for ego instruction. Here, a positive coefficient would mean that the dependent variable was higher in the ego instruction condition compared to the task instruction. A negative coefficient would mean that the dependent variable was lower in the ego instruction condition compared to the task instruction.

The continuous variables of ego DGO and task DGO scores were added in step 2 to also test main effects on all dependent variables. A positive coefficient here would mean a positive change in the dependent variable response associated with a positive 1-unit change of the predictor, thus a positive relationship. A negative coefficient would mean a negative change in the dependent variable associated with a positive 1-unit change in the predictor, thus a negative relationship.

All possible two-way interaction terms (ego DGO x task DGO, instruction x ego DGO and instruction x task DGO) were entered in step 3. Finally, the three-way interaction term (instruction x ego DGO x task DGO) was entered in step 4. As mentioned in the data analysis, all significant interactions were then analysed using simple slope analysis.

Table 37. Study 3. Summary of moderated hierarchical regression analysis for predicting value, self-confidence, somatic anxiety, cognitive anxiety and free throws made.

	Value			Self-confidence		
	B	*SE*	*p*	*B*	*SE*	*p*
Step 1						
Instruction (-1)[a]	-0.07	0.04	.080	-0.94*	0.40	.021
Step 2						
Instruction (-1)[a]	-0.07	0.04	.080	-0.94*	0.40	.021
Ego DGO	-0.12	0.06	.054	-1.07	0.56	.057
Task DGO	0.55***	0.08	.000	4.33***	0.77	.000
Step 3						
Instruction (-1)[a]	-0.07	0.04	.073	-0.94*	0.40	.021
Ego DGO	-0.17*	0.07	.011	-1.36*	0.62	.030
Task DGO	0.48***	0.09	.000	3.87***	0.85	.000
Ego DGO x Task DGO	-0.06	0.09	.524	0.06	0.81	.943
Instruction (-1)[a] x Ego DGO	0.09	0.05	.058	0.59	0.48	.222
Instruction (-1)[a] x Task DGO	0.16*	0.06	.013	0.90	0.67	.178
Step 4						
Instruction (-1)[a]	-0.06	0.04	.097	-0.90*	0.40	.027
Ego DGO	-0.18**	0.07	.008	-1.42*	0.62	.024
Task DGO	0.48***	0.09	.000	3.91***	0.85	.000
Ego DGO x Task DGO	-0.11	0.09	.223	-0.33	0.88	.705
Instruction (-1)[a] x Ego DGO	0.10*	0.05	.026	0.71	0.49	.154
Instruction (-1)[a] x Task DGO	0.15*	0.06	.021	0.82	0.67	.225
Instruction (-1)[a] x Ego DGO x Task DGO	0.12	0.07	.082	0.78	0.69	.261

	Somatic Anxiety			Cognitive Anxiety		
	B	*SE*	*p*	*B*	*SE*	*p*
Step 1						
Instruction (-1)[a]	0.34	0.26	.197	1.36***	0.35	.000
Step 2						
Instruction (-1)[a]	0.34	0.26	.197	1.36***	0.35	.000
Ego DGO	-0.14	0.34	.685	0.36	0.53	.506
Task DGO	-1.71***	0.46	.000	-2.72***	0.74	.000
Step 3						
Instruction (-1)[a]	0.34	0.27	.200	1.36***	0.34	.000
Ego DGO	-0.13	0.38	.735	0.75	0.58	.199
Task DGO	-1.79**	0.52	.001	-2.88***	0.80	.000
Ego DGO x Task DGO	0.01	0.48	.980	-0.29	0.77	.707
Instruction (-1)[a] x Ego DGO	-0.01	0.32	.973	-0.88*	0.41	.034
Instruction (-1)[a] x Task DGO	0.16	0.44	.719	0.38	0.57	.503
Step 4						
Instruction (-1)[a]	0.32	0.27	.231	1.33***	0.34	.000
Ego DGO	-0.09	0.38	.805	0.80	0.59	.172
Task DGO	-1.82**	0.52	.001	-2.91***	0.80	.000
Ego DGO x Task DGO	0.25	0.54	.647	0.04	0.82	.960
Instruction (-1)[a] x Ego DGO	-0.08	0.33	.808	-0.98*	0.42	.021
Instruction (-1)[a] x Task DGO	0.21	0.45	.637	0.45	0.57	.429
Instruction (-1)[a] x Ego DGO x Task DGO	-0.47	0.46	.313	-0.66	0.59	.266

	Free throws made		
	B	*SE*	*p*
Step 1			
Instruction (-1)[a]	-0.20	0.22	.352
Step 2			
Instruction (-1)[a]	-0.20	0.22	.352
Ego DGO	-0.79**	0.27	.004
Task DGO	-0.14	0.37	.707
Step 3			
Instruction (-1)[a]	-0.20	0.22	.353
Ego DGO	-0.78*	0.30	.010
Task DGO	0.09	0.41	.831
Ego DGO x Task DGO	-0.25	0.38	.519
Instruction (-1)[a] x Ego DGO	-0.08	0.26	.760
Instruction (-1)[a] x Task DGO	-0.40	0.36	.269
Step 4			
Instruction (-1)[a]	-0.21	0.22	.347
Ego DGO	-0.78*	0.30	.011
Task DGO	0.08	0.41	.840
Ego DGO x Task DGO	-0.20	0.43	.633
Instruction (-1)[a] x Ego DGO	-0.09	0.27	.729
Instruction (-1)[a] x Task DGO	-0.39	0.36	.286
Instruction (-1)[a] x Ego DGO x Task DGO	-0.09	0.38	.816

[a] Ego instruction condition coded as -1; $*p<.05$; $**p<.01$; $***p<.001$

As the three-way interaction in step 4 of the regression was not significant across all dependent variables, results reported in this section will be from step 3 controlling for all two-way interactions.

5.3.3.1 Instruction. There was a significant main effect of instruction for cognitive anxiety and self-confidence. For cognitive anxiety, the coefficient (b = 1.36, $t(151)$ = 3.99, $p < .001$) shows that cognitive anxiety was higher in the ego instruction condition than the task instruction condition (ego instruction M = 19.01, task instruction M = 17.65).

For self-confidence, the negative coefficient (b = -0.94, $t(151)$ = -2.34, p = .021) showed that participants had less self-confidence in the ego instruction condition than in the task instruction condition (ego instruction M = 27.05, task instruction M = 27.99).

These findings support Hypothesis 1, that task instruction would predict better subjective experience (via less cognitive anxiety and more confidence) than ego instruction. The instruction main effect was not significant for goal value, somatic anxiety and free throws made.

5.3.3.2 Ego DGO. Ego DGO score was a significant main effect for predicting goal value, self-confidence and free throws made. For goal value, the negative coefficient (b = -0.17, $t(191.68)$ = -2.57, p = .011) revealed that participants with higher ego DGO scores had lower goal value, across ego and task goal conditions, compared to participants with lower ego DGO scores.

For self-confidence, the negative coefficient (b = -1.36, $t(201.52)$ = -2.19, p = .03) showed that participants with higher ego DGO scores had lower self-confidence in relation to participants with lower ego DGO scores.

For free throws made, the negative coefficient (b = -0.78, $t(215.17)$ = -2.59, p = .01) revealed that participants with higher ego DGO scores made fewer free throws within both ego and task goal conditions compared to participants with lower ego DGO scores. These findings all contradict Hypothesis 2 that stated participants with higher ego DGO scores would be related to more goal value, better subjective experience (via confidence) and better performance than those with lower ego DGO scores. Ego DGO as a main effect was not significant for either somatic or cognitive anxiety, also in contrast to Hypothesis 2.

5.3.3.3 Task DGO. Task DGO scores significantly predicted goal value, somatic anxiety, cognitive anxiety and self-confidence. For goal value, the coefficient (b = 0.48, *t*(192.94) = 5.34, *p* < .011) indicated that participants with higher task DGO scores held higher value of goals across conditions compared to participants with lower task DGO scores.

For somatic anxiety (*b* = -1.79, *t*(214.48) = -3.46, *p* = .001) and cognitive anxiety (*b* = -2.88, *t*(193.01) = -3.61, *p* < .001), the negative coefficients revealed that participants with higher task DGO scores had less somatic and cognitive anxiety than participants with lower task DGO scores.

For self-confidence, the coefficient (*b* = 3.87, *t*(203.04) = 4.56, *p* < .001), showed that those with higher task DGO scores had more self-confidence across conditions than those with lower task DGO scores.

These findings support Hypothesis 3 that higher task DGO scores would be more goal value and subjective experience, in terms of self-confidence and less somatic and cognitive anxiety, compared to those with lower task DGO scores. Task DGO as a main effect was not significant for free throws made, thus not supportive of its benefit to actual performance.

5.3.3.4 Ego DGO x Task DGO. The interaction between ego DGO scores and task DGO scores was not found to be significant for any of the dependent variables, thus not supportive of Hypothesis 4a or 4b that higher ego and higher task DGO scores would moderate the other in a positive interaction on goal value, subjective experience and performance.

5.3.3.5 Instruction x Ego DGO. A trend towards a significant interaction between instruction and ego DGO scores was found for goal value (*b* = 0.09, *t*(151) = 1.91, *p* = .058). Simple slopes revealed the effect of instruction on goal value was significant in participants with low ego DGO scores (-1 *SD*: *b* = -0.14, *t*(151) = -2.63, *p* = .010), but not in participants with high ego DGO scores (+1 *SD*: *b* = 0.00, *t*(151) = 0.08, *p* = .934). The significant negative coefficient revealed that ego instruction had a negative effect on goal value in participants with low ego DGO scores, compared to task instruction which had a positive effect on goal value in participants with low ego DGO scores. This contradicts Hypothesis 5 that high ego orientation scores would moderate the positive relationship of ego instruction on goal value.

A significant interaction between instruction and ego DGO scores was found for cognitive anxiety (b = -0.88, $t(151)$ = -2.14, p = .034). Simple slopes revealed the effect of instruction on cognitive anxiety was significant in participants with low ego DGO scores (-1 *SD*: b = 2.10, $t(151)$ = 4.33, p < .001), but not in participants with high ego DGO scores (+1 *SD*: b = 0.63, $t(151)$ = 1.30, p = .196). The significant coefficient showed that ego instruction predicted more cognitive anxiety in participants with lower ego DGO scores. This finding does not support Hypothesis 5 which stated higher ego DGO scores would moderate the relationship of ego instruction predicting less cognitive anxiety. The interaction was not significant for somatic anxiety, self-confidence or free throw performance, thus also not supportive of Hypothesis 5.

5.3.3.6 Instruction x Task DGO. A significant interaction between instruction and task DGO scores was found for goal value (b = 0.16, $t(151)$ = 2.52, p = .013). Simple slopes showed the effect of instruction on goal value was significant in participants with low task DGO scores (-1 *SD*: b = -0.17, $t(151)$ = -3.06, p = .003), but not in participants with high task DGO scores (+1 *SD*: b = 0.03, $t(151)$ = 0.52, p = .606). The significant negative coefficient revealed that task instruction had a positive effect on goal value in participants with low task DGO scores. This finding contradicts Hypothesis 6, which speculated that the effect of task instruction on performance will be stronger in those with higher task DGO; however, this finding showed that the higher task DGO scores were not significant. Instead, it was the lower task DGO scores that moderated the relationship between task instruction and more goal value. The interaction was not significant for somatic anxiety, cognitive anxiety, self-confidence or free throw performance, thus also contrary to Hypothesis 6.

5.3.3.7 Instruction x Ego DGO x Task DGO. The three-way interaction in step 4 was found to be insignificant. This result does not support Hypotheses 7-10 which hypothesized that ego instruction would lead to better performance for those with high ego DGO and low task DGO and that the rest of the combinations would moderate the relationship between task instruction and more goal value, positive subjective experience and better performance.

5.4 Discussion

The aims of the present study were to extend the experimental paradigm of studies 1 and 2 to a different type of athletic performance and include subjective anxiety outcomes. Thus, the aims were to empirically test the relationship of AGT's DGOs and MCs, and particularly their interactions, on elements of subjective goal valuation, subjective anxiety and confidence and performance of skill-based free throw shooting in basketball players.

Regarding descriptive findings, no outliers were present from free throw performance 1 to free throw performance 2. This was unlike the removal of outliers in the running studies prior. Outliers were defined as participants whose difference in run performance, between their first and second run, were greater than 3 standard deviations above or below the mean difference. This was done to control for things such as incident during the week in between or change of weather conditions. This was not the case for this current experiment which was indoors and both conditions completed in succession as no exertion was needed. This difference in experiment timelines will be considered in the discussion.

In terms of original AGT predictions, like the previous two studies, the first prediction of goal choice was supported. The presentation of goals as self-referential and non-competitive led to the adoption of task goals while the presentation of goals as competitive and normative based led to the adoption of ego goals.

The second set of AGT predictions regarding participant subjective experience, in terms of goal valuation and subjective anxiety and confidence, were also supported in this final study. Particular to this study though, ego DGO scores negatively predicted goal value whereas ego DGO did not have an effect on goal value in the running studies. However, consistent with the goal valuation results of the previous studies, task DGO scores positively predicted goal value. The final result related to goal valuation was also novel to this study, in that a task MC had a positive effect (and an ego MC had a negative effect) on goal value when moderated by participants with low task DGO scores. So, for those athletes with low task DGO scores, they still value task MC goals more than ego MC goals. This has determined that task involvement is better for positive subjective goal valuation than ego involvement.

In order to explicitly measure the potentially adverse outcomes not measured in the previous two studies, this study included the CSAI-2R (Cox, et al., 2003) to measure somatic anxiety, cognitive anxiety and self-confidence. In terms of subjective anxiety and confidence, task DGO scores was the only variable that predicted somatic anxiety, cognitive anxiety and self-confidence. Task DGO scores negatively predicted both anxiety types while positively predicted self-confidence. Task MC also negatively predicted cognitive anxiety and positively predicted self-confidence, which also means that ego MC increased cognitive anxiety while decreasing athlete confidence. One novel interaction was found, in that ego MC instruction predicted more cognitive anxiety in participants with low ego DGO scores. This incongruent relationship shows the detriments of putting athletes in MCs that are not in line with their DGO profile. The addition of the CSAI-2R in the current study helped to further confirm the AGT predictions that task involvement is better for a positive subjective experience in terms of anxiety and confidence compared to ego involvement.

The most contrasting study result between the current Study 3 and the previous Study 1 and 2 are related to performance. Whereas Study 1 and 2 did not support AGT predictions that task involvement would lead to better performance compared to ego involvement, the current Study 3 did support that prediction. The running experiments found that ego MC instructions and ego DGO scores both predicted faster run time; however, the current experiment found that ego DGO scores actually predicted less free throws made and was the only variable to affect performance. This begs the question, why would ego DGO scores equate to athletes running significantly faster but shooting free throws significantly worse? Sport *performance* research needs a careful look at why the elements of AGT would affect types of performance differently. The following chapter will include an overall discussion and conclusion of all of the evidence presented in the introduction, systematic literature review and the three empirical studies.

Chapter 6:

Discussion and Conclusion

The purpose of the thesis was to identify what factors influence subjective experience and objective sport performance as grounded in AGT (Nicholls, 1984). This chapter includes a discussion of major findings related to the main effects and interactions of task and ego DGOs and task and ego MCs on the subjective experience of goal valuation, anxiety and self-confidence along with the performance of basketball free throws and a 400-meter run. These findings will be related to existing literature and implications for divergent findings explored, particularly for researchers and sportspeople interested in measuring and realizing optimal performance. This chapter will conclude with a discussion of the limitations of the research, suggestions for future research direction and a closing summary.

6.1 Discussion

6.1.1 Subjective Experience

6.1.1.1 Subjective Goal Valuation. As expressed in more detail in Appendix B, the STVSQ created for the studies in this thesis sought to measure goal value which included elements of effort, enjoyment, attainment value, importance, and intrinsic interest. This sought to encapsulate the range of subjective experience variables utilized in many of the founding AGT studies regarding intended effort, enjoyment, importance and overall value of goals (Ames, 1984; 1987; 1992; Eccles et al., 2005; Nicholls, 1984; 1989).

For main effects, task MC and DGO were more suited for predicting goal value than ego MC and DGO. In Study 2, the 400-meter running experiment with recreational athletes, task instruction led to higher goal valuation compared to ego instruction. In relation to DGO scores, overall, task DGO scores predicted better subjective experience of goal valuation. In all three studies, higher task DGO scores predicted more goal value compared to lower task DGO scores. Conversely, Study 3 (free throw experiment) found that participants with higher ego DGO scores actually predicted less goal value. This supports the AGT prediction that task involvement leads to better subjective experience in terms of goal value than ego involvement. This establishes that task MCs are valuable to athletes in terms of enjoyment, intended effort and intrinsic interest. Athletes with high task DGO scores also are the athletes who find this value in goals.

The theme of task MC and DGO being more beneficial for goal valuation continues in terms of interactions. In Study 1, the 400-meter run experiment with elite athletes, the ego DGO x task DGO interaction was significant for goal value. This result indicated that participants with higher task DGO moderated the relationship of lower ego DGO predicting higher goal value. Essentially, even with lower ego DGO scores, as long as participants had higher task DGO, they valued the goals highly, which was consistent with the high task DGO main effects. This partially supports the notion that higher task DGO would moderate the relationships between ego DGO and valuation of goals. Although this finding as an interaction is novel, as not many studies have ran this interaction, it does seem aligned with research that used median or mean splits and cluster analysis. These studies have found high task/low ego DGO groups related to similar elements of intrinsic sport motivation, enjoyment, commitment, and sport attributes (Fox, Goudas, Biddle, Duda & Armstrong, 1994; Hodge, Allen & Smellie, 2008; Roberts, Treasure & Kavussanu, 1996). This finding and its relation to the literature illustrates the necessity for further analyses of ego and task DGO interactions in sport. Crucially, such analyses should be conducted without the use of various and inconsistent splits and categories in order to process athlete profiles specifically in terms of subjective experience and sport performance.

In Study 2, the 400-meter run with recreational athletes, the MC instruction x ego DGO interaction was significant for goal value. The effect of instruction on goal value was significant in participants with low and high ego DGO scores, but the effect was stronger in those with lower scores. This result showed that task instruction had a positive effect on goal value in participants with high ego orientation scores and an even stronger positive effect in participants with low ego orientation scores. This also meant that ego instruction had a negative effect on goal value in participants with high and low ego DGO scores. For athletes with low ego DGO scores, it is understandable that this incongruent relationship between ego MC instruction and low ego DGO scores would indicate a lesser value of the goal. With less of a natural orientation towards ego, these participants would naturally not value these types of goals, but what is not aligned with the congruency assumption and begs to be asked is why would athletes high in ego DGO also not value ego goals? It is possible they know that the requirements to meet the ego MC goal (which they, as high ego DGO athletes, will feel the need to acquire in order to be successful) will require maximum exertion to the point of fatigue and thus are not evaluating the goal in terms of enjoyment. An additional explanation for why these recreational athletes who have high ego DGO scores would not value the ego MC instruction is potentially due to confidence. In the elite athlete sample this interaction was not found, so in determining the difference between samples, the varying results could be attributed to general athletic confidence. Although confidence was originally a subscale within the STVSQ created for the studies in this thesis, factor loadings confirmed all the subscales actually loaded onto a single factor and rendered a general goal valuation score. Thus, it is possible that within the recreational sample, if those that have high ego DGO are also not confident in their general running ability, the ego MC goal would not be valuable since it might not be a certainly attainable goal to beat others at. More plainly, even if recreational athletes have high ego DGO, they will not have the perceived athletic control to succeed without confidence in running and thus they will devalue the goal.

In the final experiment, Study 3, in which participants shot basketball free throws, the MC instruction x task DGO interaction was significant for goal value. Particularly, the negative effect of ego instruction on goal value was found in participants with low task DGO. This also indicated that task instruction had a positive effect on goal value in participants with low task DGO scores. This result also did not support the congruency notion, which assumed higher task DGO scores would moderate a positive effect of task instruction on goal value. Instead, low task DGO moderated the positive relationship between task MC instruction on goal value. This finding demonstrated that those athletes with low task DGO value task MC instruction more than ego MC instructions. In terms of an applied implication, this finding provides support for the overall consensus by sport and physical education interventions that focus on creating task climates over ego climates for their adaptive qualities such as goal valuation (Barkoukis, Koidou & Tsorbatzoudis, 2010; Cecchini, Fernandez-Rio, Mendez-Gimenez, Cecchini & Martins, 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls, Morley & Perry 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom, Knop & Weiss, 1995).

6.1.1.2 Subjective Anxiety and Confidence. As considered in the discussion of Study 2, the CSAI-2R scale was included in Study 3, the free throw experiment, because previous literature claimed that ego involvement leads to performance anxiety (e.g. for ego MC, see Hogue et al., 2013; for ego DGO, see Roberts, 1986). Due to the possibility that the negative outcomes of ego DGO and MC were not apparent because they were not explicitly looked for, the CSAI-2R as a self-report measure for somatic anxiety, cognitive anxiety and self-confidence (Cox et al.., 2003) was included.

In general, results of this subjective measure of anxiety and confidence were in line with the findings of goal valuation: the results indicated a consistent pattern of positive subjective experience via task involvement over ego involvement. It was found that task MC instruction led athletes to experience more self-confidence and less cognitive anxiety than the ego instruction condition. Task DGO scores predicted more self-confidence, along with predicting less somatic and cognitive anxiety. Furthermore, the results also indicated that participants' higher ego DGO scores predicted less self-confidence. It is necessary to mention that while the running performances led to the consideration that ego DGO and MC could have led to more physical anxiety, neither ego DGO nor ego MC or any interaction predicted somatic anxiety at all. Instead, ego MC demonstrated a negative impact on cognitive anxiety and self-confidence while ego DGO did not relate to either anxiety, but did negatively relate to self-confidence.

These results corroborate existing literature that has also found task DGO to positively relate to perceived sports ability and sources of sport confidence (Abrahamsen, et al., 2008a; 2008b; Bortoli et al., 2011; 2012; Iwasaki & Fry, 2016; Kim et al., 2011; Machida et al., 2012; Magyar & Fetlz, 2003), pleasant psychobiosocial states and negatively to unpleasant psychobiosocial states (Bortoli et al., 2011; 2009; 2012), and positive coping strategies to limit anxiety (Iwasaki & Fry, 2016; Kim et al., 2011; Kristiansen, et al., 2008; Ntoumanis et al., 1999; Pensgaard, 1999). The results also align with past research that has found task MC to be advantageous to performance specifically in terms of experiencing less psychological difficulties and gaining more confidence and positive performance coping (Abrahamsen et al., 2008a; Abrahamsen et al., 2008b; Iwasaki & Fry 2016; Kim et al., 2011; Kristiansen et al., 2008; Machida et al., 2012; Magyar & Feltz, 2003; Ntoumanis, et al., 1999). The current findings also support research that has found ego MC to be detrimental to confidence along with anxiety-provoking and negatively related to coping strategies in performance settings (Abrahamsen, et al., 2008; Iwasaki & Fry, 2016; Kim et al., 2011; Kristiansen, et al., 2008). Notably, ego DGO evidence that was previously demonstrated to positively relate to perceived sports ability and competence (Abrahamsen, et al., 2008a; 2008b; Bortoli et al., 2011; 2012; Kim, et al., 2011; Ntoumanis & Biddle, 1998), approach coping (Kim et al., 2011), coach assessment of performance (Cervelló, et al., 2007), negatively correlate to the intensity of cognitive anxiety (Ntoumanis & Biddle, 1998) along with positively predicting external sources of sport confidence (Magyar & Feltz, 2003) and pleasant psychobiosocial states (Bortoli et al., 2011; 2009) were not supported.

More generally, the subjective anxiety and confidence findings from the current study supports interventions whose objective is increasing task DGO, by way of increasing task MC, in order to facilitate the positive mental, emotional and behavioral benefits related to task DGO (Barkoukis, et al., 2010; Cecchini, et al., 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Mclaren et al., 2015; Nicholls et al., 2016; Smith et al., 2007). These findings also characterize interventions set on reducing ego MC and increasing task MC as important since these interventions help coaches and physical education teachers create task MCs so that athletes and students experience more self-confidence, enjoyment, effort, satisfaction, mental toughness and less anxiety, stress, worry and negative affect (Barkoukis, Koidou & Tsorbatzoudis, 2010; Cecchini, Fernandez-Rio, Mendez-Gimenez, Cecchini & Martins, 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls, Morley & Perry 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom, Knop & Weiss, 1995). These interventions, focused on the psychological and mental well-being of athletes and students and corroborated by the current results, are worthwhile and productive in these regards.

In consideration of the interaction results, the instruction x ego DGO interaction was significant for cognitive anxiety. Specifically, the effect that ego instruction predicted more cognitive anxiety was found in participants with lower ego DGO scores. This also meant that task instruction predicted less cognitive anxiety in participants with lower ego DGO scores. This incongruent interaction finding suggests that ego MC is detrimental for those that are not high in ego DGO, since it predicted anxiety for those low in the 'matching' ego DGO. For low ego participants, the task instruction predicted less anxiety, consistent with nearly all intervention work that stresses the importance of task MCs over ego MCs (Barkoukis, Koidou & Tsorbatzoudis, 2010; Cecchini, Fernandez-Rio, Mendez-Gimenez, Cecchini & Martins, 2014; Hassan & Morgan, 2015; Hogue, et al., 2013; Nicholls, Morley & Perry 2016; Smith, et al., 2007; Smoll, et al., 2007; Theeboom, Knop & Weiss, 1995).

6.1.2 Performance

6.1.2.1 Free Throws. In the free throw experiment of Study 3, there was not a MC instruction main effect on free throw performance even though ego MC instruction did predict more cognitive anxiety and less self-confidence. This finding is similar to the findings of Gershgoren et al. (2011) that did not find an instruction effect on soccer player penalty kicks. However, contrary to the relation of ego DGO and positive performance via coach assessment (Cervelló, et al.,2007) as assessed in the literature review, Study 3's free throw variable found that participants with higher ego DGO scores actually predicted less made free throws compared to participants with lower ego orientation scores. Nicholls' (1984) original AGT stated that ego involvement could be most damaging for those with low confidence or competence. For Study 3, ego DGO not only predicted less free throws made, but it also predicted less confidence. Self-confidence also correlated to free throws made, thus supportive of Nicholls' (1984) emphasis on confidence within ego DGO. A further explanation for this finding is that contrary to task DGO that defines success as the consistent pursuit of mastering of skills (e.g. which could lead to more practice of such skills as free throw shooting), ego DGO defines success as beating others. This definition of success is therefore not conducive to more time practicing refined motor movement skills such as free throw shooting. This suggests that the higher the ego DGO score, the less athletes are likely to be practicing such skills which could result in poor and inconsistent skill performance.

6.1.2.2 400-meter Run. The performance findings for the 400-meter run, in both Study 1 and Study 2, contradict the existing literature and thus completely shift the traditional narrative of task involvement being more conducive for better performance than ego involvement. Within the performance variable of running, this section discusses run-time, peak heart rate and perceived exertion. In terms of objective running performance, both Study 1 and 2 running experiments actually found that ego MC instruction led to faster run times and higher peak heart rates, or more physical exertion. This indicates that task MC instruction actually predicted slower run times and lower peak heart rates, thus less exerted effort. Moreover, ego MC instruction also led to higher perceived exertion in the sample of recreational athletes.

The findings that ego MC instruction led to better performance via faster run-times and higher peak heart rates are contrary to the notion that task climates relate to and predict better performance than ego climates. Although physical objective performance variables are limited in existing research, these findings contradict the evidence found in the systematic literature review that VO_{2max} (Buch, et al., 2016) and match performance player self-assessment (Cervelló, et al., 2007) were significantly correlated to task climate and not related to ego climate.

The findings that the ego instructed MC predicted faster 400-meter running times over the task instructed MC most clearly contrasts with the evidence from the VO_{2max} treadmill experiment (Buch,et al., 2016) and the youth 1-mile run in their physical education class (Xiang, et al., 2004), which both found task MC to relate to better run performance. Although all results are from running performance experiments, the current 400-meter runs averaged between one minute and 21 seconds to one minute and 24 seconds while the VO_{2max} treadmill experiment consisted of a 20-minute running warmup followed by a more intense four to seven minute run until exhaustion and the youth one-mile average was 11 minutes and 7 seconds. Without many objective performance variables in the research, it is possible that short exertion-based performances do benefit from ego MCs.

From a theoretical perspective, a potential explanation for the current studies is that a 400-meter run at optimal running performance speed will push athletes to a very uncomfortable place of fatigue and pain that they must endure in order to maintain a fast pace (Bale, 2016). With the ego MC instruction and a place on the leader board or a specific person to beat, an athlete can endure or ignore the momentary pain for a longer lasting achievement marked by external validation (Deroche et al., 2010). Although task goals emphasize effort and “trying one’s best,” they also emphasize enjoyment and having fun. Enjoying a run can be difficult to reconcile with enduring pain and the notion of “trying your best” will have limitations regarding “the best” under these circumstances. It could be that in setting a task goal, the criteria for success requires a trade-off between effort and enjoyment, whereas when setting an ego goal, there is no trade off, so effort is more intense and running times are faster.

Regarding ego DGO, the findings from the 400-meter run in Study 1 and 2 are mostly in congruence with the performance evidence found from the systematic literature in that ego DGO is positively related to performance (Buch et al., 2016; Cervelló, et al., 2007). In both Study 1 and 2, higher ego DGO scores predicted faster run times compared to lower ego DGO scores across both instruction conditions. Higher ego DGO scores also predicted more perceived exertion compared to participants with lower ego DGO scores in elite athletes across instruction and positively related to perceived exertion in recreational athletes in the ego MC instruction. Given that the ego DGO and ego MC results predicted better running performance seems to fit with the description of ego involvement from original AGT work that in “experimental settings where tasks are of relatively short duration and task requirements are clearly specified” (p. 340), ego involvement is unlikely to impair performance and could even aid in performance in the short-term (Nicholls, 1984).

One conspicuous result from Study 1, the 400-meter run experiment with the elite athlete sample, found that athletes with higher task DGO scores predicted slower run time compared to those with lower task DGO scores. This was the only instance where task DGO negatively related to performance. In the cadet treadmill VO_{2max} experiment (Buch et al., 2016) and youth student one-mile run (Xiang et al., 2004), task DGO was unrelated to run performance, thus making the current study’s result completely novel. Higher task DGO scores predicting slower run times could be explained if athletes value enjoyment more than pain experienced by exertion as previously discussed. Future studies would be advised to examine if this result occurs in any other types of exertion performances, as in these instances task DGO could negatively affect performance.

In Study 2, the 400-meter run with recreational athletes, the instruction x ego orientation interaction was significant for perceived exertion. Ego MC instruction had a positive effect on perceived exertion that was strongest in participants with high ego DGO scores, but this positive effect was also demonstrated in participants with low ego DGO scores. This is supportive of the congruency concept since ego MC instruction had a positive effect on perceived exertion performance strongest in those with higher ego DGO scores.

The final moderating, and most novel, relationship tested was the three-way interaction of MC instruction x ego DGO x task DGO. This interaction was found to be significant for run time and peak heart rate in Study 2, the 400-meter run with the recreational athlete sample. This means as running speed increased (run-time decreased), heart rate also increased (more effort exerted). According to the three-way interaction, it was found that the effect of instruction on run time and peak heart rate was significant in participants with high ego/low task DGO, high ego/high task DGO and most notably, strongest in participants with low ego/low task DGO. The only participants that the interaction was not significant for were those with low ego/high task DGO. Each of the significant interactions found that the DGO profiles (high ego/low task, high ego/high task & low ego/low task) all ran faster and had higher peak heart rates in ego MC instruction and slower run time with lower peak heart rates in task MC instruction. These findings demonstrate that the majority of DGO profile groups performed better in the ego

MC, except for the one DGO profile group that was most incongruent with an ego MC: low ego/high task DGO.

In consideration of the systematic literature review, only two studies included the three-way interaction MC x task DGO x ego DGO (Buch et al., 2016; Kim et al., 2011). Kim et al. (2011) found that only task MC positively predicted perceived controllability when moderated by high ego/high task DGO profiles, but this discussion focuses more on Buch et al.'s (2016) findings from their exertion-based experiment that is more similar to the experiment in current studies. In line with high ego/low task DGO group being congruent with an ego MC, Buch et al. (2016) found in their VO_{2max} treadmill experiment that run performance was also significantly and positively impacted by ego MC in participants with congruent high ego/low task DGOs. These findings align with the idea of high-performance during goal congruence, which is when the MC aligns with a person's individual DGO (Cable & Edwards, 2004).

Furthermore, Buch et al. (2016) found that task MC negatively predicted run performance in participants with low ego/low task DGOs which also aligns with the findings of the current study. This could be explained by low ego/low task DGO groups being the least motivated DGO profile (Roberts, 2012) to the extent that they are even unmotivated by task MCs which have been found to render positive outcomes for a variety of levels of DGOs across physical activity (Ntoumanis & Biddle, 1999). However, the 400-meter run results show that this low ego/low task DGO group actually had the strongest moderation effect of ego MC instruction on run performance and heart rate exertion. Along with the high ego/high task DGO group also performing best under ego MC instruction, perhaps when DGOs are equivalent (low/low or high/high), from the most to least motivated groups, ego MCs figuratively "get more out of" athletes for short exertion performances. This notion could support the aforementioned argument that ego instructed MCs could render positive performance since the pain and fatigue is known to only last a very short time in these situations and provide a validating reward once completed.

In general, the salience of these ego MC goals might possibly be due to observer effects or social facilitation inherent in the experiments conducted for this thesis. Triplett (1898) found that cyclists performed better when they trained as a group compared to training on their own against the clock. This was later called social facilitation (Allport, 1920), defined as the improvement in performance when in the presence of other people including competitors or audience members compared to performance when alone.

Audience effects (Dashiell, 1935) are a type of social facilitation in which the presence of others watching influences a person's performance, usually influencing them to perform better. In the present studies, knowing the experimenter was watching and timing or recording could have made ego MC more salient than task MC. However, this effect would have also been inherent in the Study 3 free throw experiment due to the nature of experimentation. This potential effect could be of interest to future studies seeking to assess if the audience effect is subject to performances that are either exhaustion or skill based.

6.2 Implications

The theoretical and applicable implications of this research are broadly twofold in that (a) the definition and measurement of sport performance needs to be refined and (b) the AGT factors that contribute to optimal performance should be reconsidered and applied more cohesively.

6.2.1 Theoretical Implications

Explanations and definitions of sport performance include perceptual, cognitive and strategic aspects of behaviour (Eklund & Tenenbaum, 2014) and "psychological, cognitive, emotional, behavioural and psychophysiological inhibitors of consistent, excellent performance" (Portenga et al., 2016, p. 6). This shows the very broad range of variables that constitute sport performance in research of athlete performance. This creates a subjective versus objective performance dilemma. Many emotional and mental aspects of sport performance are clearly important and even indicative of actual performance, but the variables themselves are *associated* with performance as opposed to *being* the objective performance variables. By incorporating both subjective experience variables such as goal valuation and objective performance measures in the current experiments, results showed that subjective value and actual performance do not actually relate to one another. This stresses the importance of measuring objective performance in order to directly facilitate sport success.

In many instances within AGT research in sport, variables rely on self-reported data, even when attempting to measure actual performance. Competition self-assessments or measuring 'satisfaction with performance' are still subjective and do not allow for opportunities to make direct findings regarding optimal performance results. By measuring objective performance in two ways, as exertion-based running and skill-based basketball free throws, the studies within this thesis were able to differentiate AGT effects in a novel way amongst the specific type of performance, particularly regarding athlete ego DGO scores which were found to facilitate running but impair free throw shooting.

6.2.2 Application Implications

Within the AGT prediction of performance (Nicholls, 1984) is the specificity of the longevity of task over ego in maintaining efficient performance. It is important here to differentiate between long- and short-term benefits of MCs and DGOs. The interventions that highlight fostering task involvement and attempt to diminish ego involvement have been found to focus on the long-term nature of perseverance in sport (Ntoumanis & Biddle, 1999) rather than the short-term performance outcomes. For coaches and sport organizations who are focused on these long-term benefits of sport participation, this is helpful. However, for competitive athletes and teams, diminishing ego involvement is not necessarily conducive to their immediate performance, especially for exertion-based performances.

Although the congruency effects were not extremely clear cut in the current findings, the use of looking at athletes as their full task and ego DGO profile and including the positive interaction effects of ego MC is a place to start. Sport is innately competitive (Duda & Nicholls, 1992) and participation in it does not need to be solely based on either well-being or winning. It can be both. Especially for athletes who are naturally ego-oriented, the findings show this can be a positive attribute (Fox, Goudas, Biddle, Duda, & Armstrong, 1994; Standage & Treasure 2002; Xiang, McBride, Bruene, & Liu, 2007). Instead of trying to change the ego DGO aspect of athletes, bolstering their task DGO and/or creating MCs that allow them to master skills, even if it is in order to use the skills to compete and win against others, will lead to the use of both task and ego conceptions of ability. This will allow for a successful and well-rounded athlete.

6.3 Limitations and Recommendations

Limitations of the studies within this thesis include the lack of long-term information for the ways AGT principles affect performance, issues with measures, sample populations and type of sports included, along with a western bias in terms of generalisability.

Longitudinal interventions highlight task MC while this thesis' first key finding was that ego MC instructions led to better run performance. This discrepancy might come down to short-term MC manipulations not showing the negative effects of ego as the long-term interventions set out to change, such as burn-out and drop-out rates (Ntoumanis & Biddle, 1999). Further, in consideration of the 400-meter running studies (Study 1 & Study 2), without the specific anxiety and confidence measures which were added to the final free throw experiment (Study 3), those subjective and potentially negative outcomes cannot be accounted for. Adding the CSAI-2R measure to the Study 1 and 2 running experiments could give insight into the exertion performance relationship to anxiety and confidence. A mediation of confidence with ego DGO could be helpful for future studies that seek to determine when performance is enhanced or impaired by ego involvement.

Another limitation that could be addressed is in using an exertion-based performance measure that can be done twice in one experimental setting as this would be useful in terms of time and participant retention. Eliminating the need to have two separate testing days would also allow for less potential confounding variables to skew results in the time taken between participation days (which was roughly a week). Measuring the difference between participants' first and second performance attempts and implementing the removal of outliers of ±3 standard deviations above or below the mean was done to combat this testing day difference. The exertion experiments (Study 1 and 2) had outliers removed while Study 3, which tested skill-based performance on a single day, did not have any. An exertion-based performance measure that can be done on the same day would thus potentially limit the need for outlier removal and better suit open science practices.

A final limitation in terms of measures used is in regard to the heart rate monitor. While it reported participant peak heart rate during the 400-meter runs of Study 1 and 2 in order to objectively measure exertion, participant baseline or resting heart rates were not recorded. By implementing this additional measurement, a more accurate rate of objective exertion can be viewed by subtracting the resting heart rate from the peak heart rate and using that number as the exertion score rather than just the peak score. This would better account for differences in heart rates across athletes with different overall fitness levels.

While the three studies in this thesis sought to account for athlete competition levels (Study 1 elite vs. Study 2 recreational) and objective performance type (Study 1 & 2 exertion-based vs. Study 3 skill-based), further limitations are variations not accounted for such as type of sport (individual vs. team; contact vs. non-contact) and location or cultural impact (individualistic vs. collectivistic).

Type of sport was not expected to have any impact on the data based on consistent AGT findings from the literature review that spanned a range of team and individual sports that included both contact and non-contact sports (Refer to Table 2 for sport ranges). Other studies of sport motivation (Lautenbach et al., 2021) and mental toughness (Nicholls et al., 2009) have considered a sport type difference but found it was not significant. However, due to the criticism regarding the lack of objective performance variables in existing research as maintained throughout this thesis, future research could include sport type analysis to either confirm or deny the trends found in current research and the systematic literature review.

The three studies within this thesis sought more generalisability through expanding the sample of athlete competition levels and types of objective performance. However, generalisability of findings must always be stated in light of location and culture. As Steinhilper (2015) explains as "an implicit 'West to Rest' orthodoxy" (p. 537), academic writings coming from western countries tend to haughtily assume normative status and imply widespread conclusions. As a final limitation of this thesis and studies it contains, western centrism should be noted. From the systematic review, 16 of the 17 articles included came from western countries (refer to Table 2 "Location"), including Spain, Norway, Italy, Britain and the USA. The only non-western study incorporated was from Korea (Kim et al., 2011). Although Kim et al.'s (2011) findings were similar to the rest, it was this paper in particular that specifically highlighted the positive benefits of ego involvement in competitive athletes. As an American author at a British institution who recruited participants in both Britain and the USA, the western bias should be mentioned particularly in terms of the transferability across cultures and generalisability of findings.

6.4 Conclusion

AGT holds that sports motivation derives from a desire to demonstrate competence by achieving goals. The types of the goals a person might set can be broadly characterised as either task (goals that relate to mastery of a task, hard work and enjoyment) or ego (goals that relate to the achievement of a normative standard). It is argued that the actual goal a person adopts is influenced by their DGO that predisposes them to setting certain types of goal and the MC, which describes the cues in the environment that indicate the type of goal that should be adopted (e.g. instructions from a coach). A great deal of empirical work has explored the motivational, emotional, and psychosocial consequences of setting task and ego goals, and a broad consensus had emerged that task goals are optimal in terms of enhancing training persistence and exercise adherence, reducing anxiety, and encouraging enjoyment of sport. As a consequence, a key aspect of many sport psychology interventions is to encourage participants to adopt task goals. However, one area in which there is less consensus is the role of different goal types in sports *performance*. For example, while there is evidence that ego goals may be adaptive for elite level performance, little is known about the impact of ego goals on performance in amateur and recreational sport. Indeed, few studies have systematically explored how goals cued by the MC interact with athletes' DGO to affect sports performance. This is an important question, as in many sports settings small performance differences can lead to very large differences in outcome.

Here this issue is addressed by examining the effect of task and ego MC instructions on athletic performance in two separate studies of elite (Study 1) and recreational (Study 2) athletes running a 400-meter race. Each athlete ran twice, once under task instructions and once under ego instructions. In addition to their time, self-report effort and their valuation of the goal was also measured. The key findings from the moderated regression analysis of both studies were that (a) that participants ran faster in the ego instructed MC, irrespective of their DGO and (b) ego DGO negatively predicted run time, whereas task DGO score positively predicted run time. In other words, athletes with higher levels of ego DGO ran faster, and those with higher levels of task DGO ran more slowly. In the recreational study, a third key finding was a three-way interaction of MC instruction x ego DGO x task DGO that found (c) the majority of DGO profiles (high ego/high task, high ego/low task and low ego/low task) all ran faster and exerted more effort in the ego MC instruction compared to the task MC instruction. These results are striking, because they suggest that ego achievement goals and higher levels of ego DGO are optimal for sports performance, and that high levels of task DGO and task MC may even be suboptimal for sports performance. How can these effects be understood from a theoretical perspective? One plausible explanation presents itself if one considers that optimal running performance often involves a degree of pain and suffering as the athlete forces themselves to maintain a fast pace. Ego oriented goals emphasise success and winning, and as long as goal achievement is likely, unpleasant physical sensations can be endured. However, although task goals prioritize effort, they also emphasise enjoyment. Enjoying a run can be hard to reconcile with experiencing pain. It may be that when a task goal is set, the criteria for success requires a trade-off between effort and enjoyment, whereas when an ego goal is set there is no trade off, so effort is more intense and running times are faster. In contrast to the performance data, the self-report goal valuation data showed that participants intended to try harder in the task MC. This inconsistency is hard to interpret, given the demand characteristics of the questionnaire, but it does suggest that athletes either know they should say they will try hard when given task instructions, (in which case self-report data on motivation should be treated with extreme caution), or that ego instructions have some motivational power that the athlete is not consciously aware of. Overall, the findings in the current study show that subjectively, participants valued task goals more than ego goals, which matches with existing literature that favours a task MC. However, objectively, participants performed much better in the ego MC which goes against all founding and existing AGT research.

Upon reflection of these inconsistent results across elite and recreational athlete samples, it was considered that it could be the objective performance measure that was the key to understanding the results. The negative effect typically found in ego MCs could not impair performance if it is exertion based, such as running the 400-meter. Even if the ego MCs produce competitive anxiety, that could not only explain the increased heart rates it could potentially aid in exertion if the athletes could use the excessive adrenaline to run faster than if they were in a calmer, non-aroused state, such as one that task MCs usually produce. For these reasons, the final experiment, Study 3, switched from the objective exertion-based running performance to an objective skill-based basketball free throw shot. A type of performance that requires concentration, skill and execution. Measures of anxiety were also included to assess the subjective experience of all task and ego DGOs and MCs. Findings of this experiment were more in alignment with AGT predictions and past research and interventions that highlight the negative effect ego involvement has on subjective experience, particularly cognitive anxiety, and performance. Beyond the gap of limited objective sport performance variables in AGT research, the differences in findings from exertion to skill- based sport performances especially calls on the notion that sport *performance* needs to be examined far more with AGT literature.

Appendix A

Task and Ego Orientation in Sport Questionnaire

Consider the statement "I feel most successful in sport when…" and read each of the following statements listed below and indicate how much you personally agree with each statement by entering an appropriate score where:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

I feel most successful in sport when….

1. I am the only one who can do the play or skill ______

2. I learn a new skill and it makes me want to practise more ______

3. I can do better than my friends ______

4. The other cannot do as well as me ______

5. I learn something that is fun to do ______

6. Others mess up "and" I do not ______

7. I learn a new skill by trying hard ______

8. I work really hard ______

9. I score the most points/goals/hits, etc. ______

10. Something I learn makes me want to go practice more ______

11. I am the best ______

12. A skill I learn really feels right ______

13. I do my very best. ______

Appendix B

Creation of the Subjective Task Value in Sport Questionnaire (STVSQ)

The STVSQ was first created originally and written about in this appendix as involving subjective *task* value, but later wordage was changed in this thesis to subjective *goal* value. This was changed because 1. the term *task* is used already in AGT as in 'task and ego DGOs and MCs' and 2. it is the goal that is experimentally manipulated, not the task itself in the studies. Original research that founded this STVSQ creation though used the term subjective task value which will be used in this appendix.

Current subjective task value literature (Eccles, O'Neill & Wigfield, 2005; Hagemeier & Murawski, 2014; Zhu, Sun, Chen & Ennis, 2012; Battle & Wigfield, 2003) stems from Eccles' (1983) expectancy value theory research. Original expectancy value theory saw task value as a person's eagerness of the consequence that either succeeding or failing at a task would bring (Atkinson, 1964). Eccles (1983) expanded on this, stating that achievement motivation stems from a combination of a persons' expectancy beliefs along with subjective task value.

Expectancy beliefs represent a person's perceptions of success in a certain situation, including their ability perception and perceived task difficulty (Eccles & Wigfield, 2002). Eccles (1983) suggested 4 domains as part of subjective task value: attainment, interest, utility and cost. Attainment relates to the personal importance or meaningfulness of the task. Interest refers to the simple enjoyment of the goal. Utility speaks of the usefulness of the task at hand for the individual's future endeavors and cost refers to loss of time or valued alternatives.

During the creation of this study's STVSQ, the Expectancy Value Questionnaire (EVQ) (Eccles & Wigfield, 1995; Eccles et al., 2005) was used. The EVQ was developed based on Eccles' expectancy value theory (1983) as reference. The EVQ was found to be able to collapse across gender and age from adolescents onward. The scale used Michigan Study of Adolescent Life Transition (MSALT) data and other pilot studies to test the reliability of the scale across domains. Replicating factor structure has led to the recommendation that this scale's items can be adapted for other achievement goal theory domains, even stating "sports…or another achievement-related domain can be substituted for 'math' in these items" (Eccles et al., 2005. p. 246). Additionally, discriminant, face and predictive validity were all assessed and confirmed. In particular, predictive validity was found to be very high in the pilot studies as well as in further studies involving sport (Eccles & Harold, 1991). Further sampling in sport found a relation between the construct subjective task value with participation decisions and behaviours (Eccles et al., 2005; Eccles & Barber, 1999). Finally, the subjective task value scales were found to best predict later achievement behaviour (Eccles et al., 2005) and could shed light onto the relationship between participant's value of the goal and forthcoming performance.

For the current thesis' experiments in particular, the subsections of "intrinsic interest value," "attainment value/importance," and "effort & expectancy beliefs" were included, notably not including the sections regarding utility and cost. Since the experiments are creating an immediate goal and performance attempt, unlike most of the subjective task value research that are based on longitudinal studies (such as year-long educational classes or month-long training courses: Eccles & Wigfield, 1995; Eccles et al., 2005; Zhu, Sun, Chen & Ennis, 2012), this eliminates the need to analyse utility, as there is not a "future" within the current experiment, along with cost since the experiment is not substantially time or financially consuming.

The original intention was to create a questionnaire with sub-scales measuring the 3 factors of interest, attainment and expectancy beliefs, but the questionnaire actually produced a single measure of overall value. The questionnaire here, is shown how it was originally created, with the 3 sub-scales; however, the results are reported in this write-up based on the overall single score of value it rendered.

Subjective Task Value in Sport Questionnaire

1. What is your goal? ____

<u>Intrinsic Interest Value</u>

2. Please rate the value you place on this goal on a scale of 1 – 7.

1	2	3	4	5	6	7
not at all valuable			moderately valuable			extremely valuable

3. How much do you think you will enjoy this run?

1	2	3	4	5	6	7
not at all enjoyable			moderately enjoyable			extremely enjoyable

4. How happy will you be if you achieve this goal?

1	2	3	4	5	6	7
not at all happy			Moderately happy			extremely happy

Attainment Value/Importance

5. How disappointed will you be if you do not achieve this goal?

1	2	3	4	5	6	7
not at all disappointed			moderately disappointed			extremely disappointed

6. How important is it to you to be successful at this goal?

1	2	3	4	5	6	7
not at all important			moderately important			extremely important

7. How important is it to you to not fail at this goal?

1	2	3	4	5	6	7
not at all important			moderately important			extremely important

Effort & Expectancy

8. How hard will you try to achieve this goal?

1	2	3	4	5	6	7
not at all hard			moderately hard			extremely hard

9. How certain are you that you will achieve this goal?

1	2	3	4	5	6	7
not at all certain			moderately certain			extremely certain

10. How difficult will it be to achieve this goal?

1	2	3	4	5	6	7
not at all difficult			moderately difficult			extremely difficult

11. How confident are you that you will achieve this goal?

1	2	3	4	5	6	7
not at all confident			moderately confident			extremely confident

Appendix C

Borg Rating of Perceived Exertion (RPE) Scale

While doing physical activity, we want you to rate your perception of exertion. This feeling should reflect how heavy and strenuous the exercise feels to you, combining all sensations and feelings of physical stress, effort, and fatigue. Do not concern yourself with any one factor such as leg pain or shortness of breath, but try to focus on your total feeling of exertion.

Choose the number from below that best describes your level of exertion.

#	**Level of Exertion**
6	No exertion at all
7	
7.5	Extremely light (7.5)
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

9 corresponds to "very light" exercise. For a healthy person, it is like walking slowly at his or her own pace for some minutes

13 on the scale is "somewhat hard" exercise, but it still feels OK to continue.

17 "very hard" is very strenuous. A healthy person can still go on, but he or she really has to push him- or herself. It feels very heavy, and the person is very tired.

19 on the scale is an extremely strenuous exercise level. For most people this is the most strenuous exercise they have ever experienced.

Appendix D

Study 1: Coding of STVSQ 1 & Inter-rater Reliability

Code	Goal Type
1.00	Ego goal
2.00	Task goal
3.00	Unspecific running goal
0.00	Unrelated

Ego Instruction			Task Instruction		
ID	STVSQ1 What is your goal?	STVSQ1 CODE	ID	STVSQ1 What is your goal?	STVSQ1 CODE
1	15	1.00	1	01:30	2.00
2	75 seconds	1.00	2	75 seconds	1.00
3	basketball	0.00	3	01:20	2.00
4	7th place	1.00	4	62 seconds	1.00
5	top 10, hopefully #7/8, time of 62 sec	1.00	5	under 90 seconds	1.00
6	4	1.00	6	60 sec	2.00
7	01:30	2.00	7	01:45	2.00
8	01:20	2.00	8	01:30	2.00
9	01:30	2.00	9	01:30	2.00
10	01:20	2.00	10	01:20	2.00
11	01:25	2.00	11	01:30	2.00
12	55 secs	2.00	12	01:10	2.00
13	02:00	2.00	13	01:00	2.00
14	01:10	2.00	14	01:15	2.00
15	01:30	2.00	15	under 2	2.00
16	01:30	2.00	16	01:45	2.00
17	01:15	2.00	17	01:10	2.00
18	01:35	2.00	18	01:45	2.00
19	01:35	2.00	19	01:30	2.00
20	01:10	2.00	20	1:10-1:15	2.00
21	01:15	2.00	21	01:20	2.00
22	01:25	2.00	22	01:15	2.00
23	02:00	2.00	23	01:30	2.00
24	83.60	1.00	24	01:25	2.00
25	80.1	1.00	25	Run without stopping	3.00
26	86.6	1.00	26	01:40	2.00
27	10	1.00	27	100 sec	2.00
28	89	1.00	28	90 s	1.00
29	89.2	1.00	29	89.1 sec	1.00
30	19	1.00	30	02:30	2.00
31	86.6	1.00	31	2 min	2.00
32	82.7	1.00	32	85.2	2.00
33	84	1.00	33	3 min	2.00
34	78	2.00	34	2 min	2.00
35	01:00	2.00	35	maintain 1:15	2.00
36	sub 1 minute	2.00	36	56	2.00
37	60 sec	2.00	37	90 sec	1.00
38	01:10	2.00	38	to not get a stitch	3.00
39	71.1	1.00	39	Win BUCS in judo and american football	0.00
40	12	1.00	40	60s	2.00
41	72.6 seconds	1.00	41	To perform as well as I can	2.00
42	To get to the finish line before Taylor	1.00	42	1 min 30 sec	2.00
43	Beat 90 seconds	1.00	43		0.00
44	86.6	1.00	44	83	1.00
45	86.6	1.00	45	87.5	1.00
46	62 seconds	1.00	46	60 seconds	2.00
47	1:04	2.00	47	80 seconds (half the spee of Usain Bolt)	1.00
48	71.1 sec	1.00	48	90 sec	1.00
49	16	1.00	49	1 min	2.00
51	1st goal - beat my time 2nd goal - place top 15 (71.6) 3rd goal - beat steven & ryan (66 sec)	1.00	51	complete the run w/out looking stupid	3.00
52	Between the #3 & #4 time	1.00	52	Run a sub 2 minute 400m	2.00
53	66.5	1.00	53	aprox. 1 min	2.00
54	74.9	1.00	54	90 s	1.00
55	75.9	1.00	55	75 seconds	1.00
56	84.3	1.00	56	90 seconds	1.00
57	74.9	1.00	57	1:35	2.00

58	16	1.00
59	15	1.00
60	20	1.00
61	5	1.00
62	Finish before 63'	1.00
63	Finish	3.00
64	75 seconds	1.00
65	win a championship	0.00
66	71.6	1.00
67	15	1.00
68	75.9	1.00
69	15	1.00
70	Beat my last time	2.00
71	01:20	2.00
72	73 seconds	2.00
73	01:25	2.00
74	01:30	2.00
75	2 min	2.00
76	01:45	2.00
77	01:30	2.00
78	01:45	2.00
79	01:20	2.00
80	74.80	1.00
81	86.6	1.00
82	84.3	1.00
83	80	1.00
84	17	1.00
85	to finish, 90.4	1.00
86	86.6	1.00
87	80	1.00
88	90.1	1.00
89	91.4	1.00
90	86.6	1.00
91	86.6	1.00
92	01:45	2.00
93	01:05	2.00
94	53.5	1.00
95	75.9	1.00
96	86.6	1.00
97	Beat my last time by 2 seconds & lead the women's who participated	1.00
98	3 - 74.8	1.00
99	to do my best	2.00
100	#6	1.00
101	5	1.00
102	80.9	1.00
103	82.7	1.00
104	90,0s	1.00
105	89.2	1.00
106	About 80-something secs.	2.00
107	20	1.00
108	69	1.00
109	86.6 seconds	1.00
110	13	1.00
111	75 secs	1.00
112	15	1.00
113	18	1.00
114	Beat Tom Hartley's time	1.00
115	Beat Tom H.	1.00
116	90.1 sec	1.00
117	16	1.00
118	I would like to come in between the 9th and 10th ranked scores, would like to come between 63.7-66.5 seconds	1.00
119	82.7	1.00
120	75 seconds	1.00
121	Beat 98s	1.00
122	to get 5th ranking	1.00
123	59.6	1.00
124	12	1.00
125	16 - 72.6	1.00
126	Be faster than #11 (69.0)	1.00
127	To finish, injured knee	3.00
128	Beat Tom Hartley	1.00

58	1:30	2.00
59	1:10	2.00
60	1:35	2.00
61	1:00	2.00
62	Finish better than last week	2.00
63	Under 1 min 45 secs	2.00
64	89 sec	1.00
65	beat 1:45	2.00
66	110	2.00
67	01:07	2.00
68	below 1:20	2.00
69	01:20	2.00
70	to beat Parsa	1.00
71	01:45	2.00
72	01:25	2.00
73	01:30	2.00
74	01:30	2.00
75	1 min 15 sec	2.00
76	02:00	2.00
77	01:15	2.00
78	01:45	2.00
79	01:30	2.00
80	80 sec.	1.00
81	01:30	2.00
82	88	2.00
83	01:45	2.00
84	2 min	2.00
85	2 minutes	2.00
86	90 seconds	1.00
87	02:30	2.00
88	1 min 35 sec	2.00
89	03:00	2.00
90	02:05	2.00
91	1:00 min	2.00
92	1:30 or less	2.00
93	01:05	2.00
94	Finishing the run	3.00
95	01:30	2.00
96	01:30	2.00
97	have the best time recorded within the study	1.00
98	to complete the run	3.00
99	02:30	2.00
100	02:30	2.00
101	2 minutes	2.00
102	To get better	2.00
103	better than last time	2.00
104	85	2.00
105	89	1.00
106	1:14	2.00
107	1 1/2 min	2.00
108	69	1.00
109	77	2.00
110	1:30	2.00
111	1 min 20	2.00
112	2 min	2.00
113	1 min 20s	2.00
114	1 m 10 s	2.00
115	Finish in a realativly competative time	1.00
116	match my last time/beat it	2.00
117	do better than last time	2.00
118	I want to run under a 1:06, so beat 10th place	1.00
119		0.00
120	To run under 100 seconds	2.00
121	Improve my time :)	2.00
122	under a minute	2.00
123	To continue to get better everyday	0.00
124	1:30	2.00
125	66.5	1.00
126	>2 min	2.00
127	To run the 400 m in under 1 min 10 seconds	2.00
128	to finish	3.00

129	69.0	1.00	129	69.0	1.00
130	Sub 78 second lap	2.00	130	Run as fast as I can	2.00
131	80.1	1.00	131	do my best	2.00
132	70	1.00	132	beat my last time	2.00
133	#20	1.00	133	to do my best	2.00
134	#10 - 66.5	1.00	134	do my best	2.00
135	to finish	3.00	135	1 min 40 secs	2.00
136	#20	1.00	136	to complete the run	3.00
137	finish the lap	3.00	137	90 seconds	1.00
138	16	1.00	138	do my best	2.00
139	20	1.00	139	1'30	2.00
140	17	1.00	140	get a good time	2.00

The coding above is the final decisions used for the experiment. A simple inter-rater reliability method of percent agreement between the two coders was used. For ego instruction, 125/139 codes were initially agreed upon by the coders, for an 89.93% original agreement rate. For task instruction, 131/139 codes were initially agreed upon by the coders, for a 94.24% original agreement rate. For the codes not agreed upon, discussion and justification between the coders was had until a final agreement was made.

Appendix E

Study 2: Coding of STVSQ 1 & Inter-rater Reliability

Code	Goal Type
1.00	Ego goal
2.00	Task goal
3.00	Unspecific running goal
0.00	Unrelated

Ego Instruction			Task Instruction		
ID	STVSQ1	STVSQ1 CODE	ID	STVSQ1	STVSQ1 CODE
1	56s or less	2.00	1	under 58	2.00
2	match	2.00	2	65	2.00
3	74-78	1.00	3	below first lap	2.00
4	#10	1.00	4	2 min	2.00
5	final spot	1.00	5	2 minutes	2.00
6	under 2	2.00	6	less than 2 minutes	2.00
7	beat 2	2.00	7	2 min	2.00
8	to at least equal 1:48	2.00	8	sub 2 mins	2.00
9	89	1.00	9	1 min 28	1.00
10	#8	1.00	10	80 secs	1.00
11	make the list	1.00	11	1 min 30 secs	1.00
12	20	1.00	12	do my best	2.00
13	55	2.00	13	finish	3.00
14	to be great	2.00	14	stay great	2.00
15	75 sec	1.00	15	personal best	2.00
16	leaderboard	1.00	16	give my best	2.00
17	59.6	1.00	17	have fun	2.00
19	1:19	1.00	19	personal best	2.00
21	20	1.00	21	beat leaderboard	1.00
22	#2	1.00	22	fit and health	2.00
23	top 20	1.00	23	1.5 mins	1.00
24	92.7	1.00	24	better than last time	2.00
25	80.1	1.00	25	80	1.00
26	15	1.00	26	2:47	2.00
27	make it	1.00	27	2:30	2.00
28	make the board	1.00	28	2 min	2.00
29	1 min 15 sec	1.00	29	fun	2.00
30	75	1.00	30	enjoy myself	2.00
31	make leader board	1.00	31	good time	2.00
32	9th - 79	1.00	32	do just as good	2.00
33	10	1.00	33	personal best	2.00
34	10	1.00	34	do it	3.00
35	make leader board	1.00	35	get it done	3.00
36	finish	3.00	36	finish	3.00
37	1:19	1.00	37	1:21	1.00
38	1:14	1.00	38	1:15	1.00
39	1:20	1.00	39	my best	2.00
40	1:12	1.00	40	try my best	2.00
41	1:20	1.00	41	under 1:30	1.00
42	1:18	1.00	42	1:20	1.00
43	1:17	2.00	43	under 1:20	1.00
44	1:17	2.00	44	under last time	2.00
45	1:12	1.00	45	1:15	1.00
46	1:18	1.00	46	do my best	2.00
47	1:20	1.00	47	beat my last time	2.00
48	87.6	1.00	48	do better	2.00
49	M rank 5 61.45	1.00	49	try hard	2.00
50	86 sec	1.00	50	do well	2.00
51	#10	1.00	51	try my hardest	2.00
52	90 secs	1.00	52	sub 90	1.00
53	#9	1.00	53	2 min	2.00
54	72.6	1.00	54	have fun	2.00
55	85	2.00	55	personal best	2.00
56	#3	1.00	56	give loads of effort	2.00
57	59.6	1.00	57	finish	3.00
58	71.6s	1.00	58	be a good person	0.00
59	66.5s	1.00	59	under 90	1.00
60	#10	1.00	60	have fun	2.00
61	#6	1.00	61	enjoy it	2.00
62	finish top	1.00	62	do best	2.00
63	#9	1.00	63	to keep up a good pace	2.00
64	#10	1.00	64	under 2 min	2.00

65	top 4	1.00	65	do my best	2.00
66	75	1.00	66	to finish faster than the others	1.00
67	top 10	1.00	67	my best	2.00
68	15	1.00	68	do well for myself	2.00
69	try hard	2.00	69	personal best	2.00
70	leaderboard	1.00	70	to finish the run	3.00
71	make leader board	1.00	71	give great effort	2.00
72	make leader board	1.00	72	work with the team	0.00
73	do my best	2.00	73	under 90	1.00
74	top 20	1.00	74	to try hard running	2.00
75	beat justin	1.00	75	try hard	2.00
76	beat mike	1.00	76	do my best	2.00
77	compete	1.00	77	personal best	2.00
78	8th	1.00	78	finish	3.00
79	leaderboard	1.00	79	do my best	2.00
80	beat david	1.00	80	to be faster than tonys time	1.00
81	tough mudder	0.00	81	try hard	2.00
82	74 sec	1.00	82	80 secs	1.00
83	beat my time	2.00	83	82 seconds	1.00
84	1:25	2.00	84	dont get hurt	3.00
85	maintain	2.00	85	personal best	2.00
86	win	1.00	86	75 sec.	1.00
87	make leader board	1.00	87	smart, push no injury	3.00
88	60 seconds	2.00	88	finish	3.00
89	1:20	1.00	89	try my hardest	2.00
90	1:30	1.00	90	ton of effort	2.00
91	1:50	2.00	91	personal best time	2.00
92	win	1.00	92	personal best	2.00
93	make board	1.00	93	1:30	1.00
94	win	1.00	94	personal best	2.00
95	#13	1.00	95	1:30	1.00
96	1:30	1.00	96	do my best	2.00
97	20	1.00	97	1:45	2.00
98	make a great time	2.00	98	better than my last time	2.00
99	beat someone	1.00	99	do okay 1:21	1.00
100	1:20	1.00	100	sub 70	1.00
101	65 sec.	2.00	101	under 70 sec	1.00
102	19	1.00	102	1:35	1.00
103	better than last time	2.00	103	1:50	2.00
104	1:30	1.00	104	less than 1:10	1.00
105	20	1.00	105	1:45	2.00
106	1:30	1.00	106	do my best	2.00
107	60 seconds	2.00	107	do better	2.00
108	try hard	2.00	108	get a good time for myself	2.00
109	make leader board	1.00	109	get better time	2.00
110	leaderboard	1.00	110	get a good time	2.00
111	try hard	2.00	111	try my hardest	2.00
112	70 sec	1.00	112	finish	3.00
113	make leader board	1.00	113	do my best	2.00
114	top 20	1.00	114	make leader board	1.00
115	place in top	1.00	115	do my best	2.00
116	top 10	1.00	116	run & do my best	2.00
117	89.2	1.00	117	get a personal best	2.00
118	#11	1.00	118	run it & do your best	2.00
119	top 3	1.00	119	PB	2.00
120	leader board top 5	1.00	120	finish	3.00
121	make board	1.00	121	do well	2.00
122	#1	1.00	122	my best	2.00
123	try hard	2.00	123	good time	2.00
124	make the leaderboard	1.00	124	try hard	2.00
125	top 5	1.00	125	get a good time	2.00
126	make leader board	1.00	126	try really hard	2.00
127	do my best	2.00	127	do my best	2.00
128	1:45	2.00	128	under 2 mins	2.00
129	90	1.00	129	stay fit	2.00
130	93	2.00	130	1 min 32	1.00
131	9th	1.00	131	finish	3.00
132	20th	1.00	132	pr	2.00
133	1:12	1.00	133	80 secs	1.00
134	beat my time	2.00	134	82 seconds	1.00
135	make leader board	1.00	135	run hard	2.00
136	#2	1.00	136	fit and health	2.00
137	win	1.00	137	75 sec.	1.00
138	1:45	2.00	138	do well for myself	2.00
139	make leader board	1.00	139	push myself	2.00
140	beat patricia	1.00	140	good time	2.00

The coding above is the final decisions used for the experiment. A simple inter-rater reliability method of percent agreement between the two coders was used. For ego instruction, 127/138 codes were initially agreed upon by the coders, for a 92.03% original agreement rate. For task instruction, 121/138 codes were initially agreed upon by the coders, for an 87.68% original agreement rate. For the codes not agreed upon, discussion and justification between the coders was had until a final agreement was made.

Appendix F

Competitive State Anxiety Inventory-2 Revised (CSAI-2R)

<u>Directions</u>: A number of statements that athletes have used to describe their feelings before competition are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel <u>right now</u> – at this moment. There are no right or wrong answers. Do not spend too much time on any one statement, but choose the answer which describes your feelings <u>right now</u>.

	Not at all	**Somewhat**	**Moderately so**	**Very much so**
1. I feel jittery.	1	2	3	4
2. I am concerned that I may not do as well in this competition as I could.	1	2	3	4
3. I feel self-confident.	1	2	3	4
4. My body feels tense.	1	2	3	4
5. I am concerned about losing.	1	2	3	4
6. I feel tense in my stomach.	1	2	3	4
7. I'm confident I can meet the challenge.	1	2	3	4
8. I am concerned about choking under pressure.	1	2	3	4
9. My heart is racing.	1	2	3	4
10. I'm confident about performing well.	1	2	3	4
11. I'm concerned about performing poorly.	1	2	3	4
12. I feel my stomach sinking.	1	2	3	4
13. I'm confident because I mentally picture myself reaching my goal.	1	2	3	4
14. I'm concerned that others will be disappointed with my performance.	1	2	3	4
15. My hands are clammy.	1	2	3	4
16. I'm confident of coming through under pressure.	1	2	3	4
17. My body feels tight.	1	2	3	4

Appendix G

Study 3: Coding of STVSQ 1 & Inter-rater Reliability

Code	Goal Type
1.00	Ego goal
2.00	Task goal
3.00	Unspecific shooting goal
0.00	Unrelated

Ego Instruction			Task Instruction		
ID	STVSQ1 What is your goal?	STVSQ1 CODE	ID	STVSQ1 What is your goal?	STVSQ1 CODE
1	leader board	1.00	1	consistency	2.00
2	10 shots made	1.00	2	good form	2.00
3	make 13	1.00	3	shoot well	2.00
4	to beat the numbers on the leaderboard	1.00	4	focusing on good form	2.00
5	9/15	1.00	5	12/15	1.00
6	as many as possible	2.00	6	consistent form, technique	2.00
7	make 11 shots	1.00	7	make 10 out of 15	1.00
8	10 shots made	1.00	8	consistency	2.00
9	make the leader board	1.00	9	good form	2.00
10	leader board	1.00	10	shoot well	2.00
11	get on the leader board	1.00	11	consistency	2.00
12	do my best	2.00	12	good form	2.00
13	make the board	1.00	13	shoot well	2.00
14	12/15	1.00	14	make 10	1.00
15	come in 3rd	1.00	15	consistency	2.00
16	9	1.00	16	good form	2.00
17	10 shots made	1.00	17	shoot well	2.00
18	number 4 on leaderboard	1.00	18	11/15	1.00
19	to beat the numbers on the leaderboard	1.00	19	have great technique	2.00
20	8 out of 15	1.00	20	focus on form and good shooting technique	2.00
21	as many as possible	2.00	21	focus on consistency of shot	2.00
22	make 11 shots	1.00	22	consistency	2.00
23	10 shots made	1.00	23	good form	2.00
24	make the leader board	1.00	24	shoot well	2.00
25	12/15	1.00	25	13/15	1.00
26	to improve my technique	2.00	26	have great technique	2.00
27	focus on consistency, form & technique	2.00	27	focus on form and good shooting technique	2.00
28	score as many as possible - beat others who usually get 8-10	1.00	28	focus on consistency of shot	2.00
29	to beat the numbers on the leaderboard	1.00	29	consistency	2.00
30	9/15	1.00	30	good form	2.00
31	as many as possible	2.00	31	shoot well	2.00
32	make 9 shots	1.00	32	10/15	1.00
33	10 shots made	1.00	33	have great technique	2.00
34	make leader board	1.00	34	focus on form and good shooting technique	2.00
35	10 shots made	1.00	35	focus on consistency of shot	2.00
36	make leader board	1.00	36	focus on technique	2.00
37	8	1.00	37	Good technique	2.00
38	On the leaderboard	1.00	38	Form	2.00
39	Reach the leaderboard	1.00	39	Technique and form	2.00
40	To make it onto the leaderboard	1.00	40	To improve my technique	2.00
41	at least 10	1.00	41	do well for myself	2.00
42	13/15	1.00	42	Consistency of shot + form	2.00
43	9	1.00	43	Form	2.00
44	Make the leaderboard	1.00	44	Good technique	2.00
45	come in first place	1.00	45	focus on form	2.00
46	make top 2	1.00	46	have consistency	2.00
47	try my best	2.00	47	technique	2.00
48	to beat the numbers on the leaderboard	1.00	48	focusing on good form	2.00
49	9/15	1.00	49	12/15	1.00
50	as many as possible	2.00	50	consistent form, technique	2.00
51	make 11 shots	1.00	51	make 10 out of 15	1.00
52	to beat the numbers on the leaderboard	1.00	52	13/15	1.00
53	9/15	1.00	53	have great technique	2.00
54	as many as possible	2.00	54	focus on form and good shooting technique	2.00
55	make 11 shots	1.00	55	focus on consistency of shot	2.00
56	10 shots made	1.00	56	consistency	2.00
57	make the leader board	1.00	57	good form	2.00

58	12/15	1.00
59	to beat the numbers on the leaderboard	1.00
60	9/15	1.00
61	as many as possible	2.00
62	make 11 shots	1.00
63	to beat the numbers on the leaderboard	1.00
64	8/15	1.00
65	make as many as i can	2.00
66	make 11 shots	1.00
67	10 shots made	1.00
68	make the leader board	1.00
69	12/15	1.00
70	to improve my technique	2.00
71	focus on consistency, form & technique	2.00
72	score as many as possible - beat others who usually get 8-10	1.00
73	13/15	1.00
74	9	1.00
75	Make the leaderboard	1.00
76	make at least 12	1.00
77	9	1.00
78	Make the leaderboard	1.00
79	to beat the numbers on the leaderboard	1.00
80	9/15	1.00
81	8	1.00
82	On the leaderboard	1.00
83	Reach the leaderboard	1.00
84	To make it onto the leaderboard	1.00
85	make shots	3.00
86	13/15	1.00
87	9	1.00
88	Make the leaderboard	1.00
89	make at least 12	1.00
90	9	1.00
91	Make the leaderboard	1.00
92	to beat the numbers on the leaderboard	1.00
93	9/15	1.00
94	as many as possible	2.00
95	make 11 shots	1.00
96	as many as possible	2.00
97	make 11 shots	1.00
98	10 shots made	1.00
99	beat people on board	1.00
100	8/15	1.00
101	do my best	2.00
102	12/15	1.00
103	to beat the numbers on the leaderboard	1.00
104	9/15	1.00
105	as many as possible	2.00
106	make 9 shots	1.00
107	to beat the numbers on the leaderboard	1.00
108	9/15	1.00
109	as many as possible	2.00
110	make 11 shots	1.00
111	10 shots made	1.00
112	beat people on board	1.00
113	8/15	1.00
114	to improve my technique	2.00
115	focus on consistency, form & technique	2.00
116	beat others who usually get 8-10	1.00
117	as many as possible	2.00
118	make 11 shots	1.00
119	10 shots made	1.00
120	beat people on board	1.00
121	8/15	1.00
122	to improve my technique	2.00
123	focus on consistency, form & technique	2.00
124	beat others who usually get 8-10	1.00
125	8	1.00
126	On the leaderboard	1.00
127	Reach the leaderboard	1.00
128	To make it onto the leaderboard	1.00

58	shoot well	2.00
59	make at least 10	1.00
60	have great technique	2.00
61	focus on form and good shooting technique	2.00
62	focus on consistency of shot	2.00
63	focus on technique	2.00
64	Good technique	2.00
65	Form	2.00
66	Technique and form	2.00
67	To improve my technique	2.00
68	do well for myself	2.00
69	13/15	1.00
70	have great technique	2.00
71	focus on form and good shooting technique	2.00
72	focus on consistency of shot	2.00
73	Form	2.00
74	Technique and form	2.00
75	To improve my technique	2.00
76	do well for myself	2.00
77	make 9 out of 15	1.00
78	have great technique	2.00
79	focus on form and good shooting technique	2.00
80	focus on consistency of shot	2.00
81	Good technique	2.00
82	Form	2.00
83	Technique and form	2.00
84	To improve my technique	2.00
85	make more than ben	1.00
86	Consistency of shot + form	2.00
87	Form	2.00
88	Good technique	2.00
89	consistency of shot	2.00
90	focus on shooting	2.00
91	make 8	1.00
92	focusing on good form	2.00
93	12/15	1.00
94	consistent form, technique	2.00
95	make 10 out of 15	1.00
96	13/15	1.00
97	have great technique	2.00
98	focus on form and good shooting technique	2.00
99	focus on consistency of shot	2.00
100	consistency	2.00
101	good form	2.00
102	shoot well	2.00
103	make 9	1.00
104	have great technique	2.00
105	focus on form and good shooting technique	2.00
106	focus on consistency of shot	2.00
107	focus on technique	2.00
108	Good technique	2.00
109	Form	2.00
110	Technique and form	2.00
111	To improve my technique	2.00
112	do well for myself	2.00
113	13/15	1.00
114	have great technique	2.00
115	focus on form and good shooting technique	2.00
116	focus on consistency of shot	2.00
117	Make 10	1.00
118	Making sure I have good technique	2.00
119	Keep good form	2.00
120	Focus on form and consistency	2.00
121	Focus on form and be consistent	2.00
122	Focus on form	2.00
123	Good technique	2.00
124	make 12 at least	1.00
125	Good technique	2.00
126	Form	2.00
127	Technique and form	2.00
128	To improve my technique	2.00

129	try my best	2.00	129	make more than before	2.00
130	13/15	1.00	130	Consistency of shot + form	2.00
131	9	1.00	131	Form	2.00
132	Make the leaderboard	1.00	132	Good technique	2.00
133	To make the leaderboard and get 6 shots in	1.00	133	To have consistent technique	2.00
134	Getting onto the leaderboard	1.00	134	Good form & technique	2.00
135	10/15	1.00	135	Focus on form	2.00
136	Make 10	1.00	136	Make 10	1.00
137	Scoring as many as I can	1.00	137	Making sure I have good technique	2.00
138	Score more than 8 free throws	1.00	138	Keep good form	2.00
139	To score as many freethrows possible	1.00	139	Focus on form and consistency	2.00
140	Making the shots	3.00	140	Focus on form and be consistent	2.00
141	Make the shots	3.00	141	Focus on form	2.00
142	Make the most (at least 8)	1.00	142	Good technique	2.00
143	better than last time	2.00	143	14	1.00
144	make leaderboard	1.00	144	consistent form	2.00
145	make the leaderboard - min 6-12	1.00	145	consistent form & technique	2.00
146	making as many as possible	2.00	146	consistent good form	2.00
147	as many shots as poss.	2.00	147	focus on form & technique	2.00
148	As many shots as possible	2.00	148	Form and technique	2.00
149	Score as many as possible (beat other people)	2.00	149	Consistency of form/shots	2.00
150	do well	3.00	150	make 8	1.00
151	make leaderboard	1.00	151	shotting form (consistency)	2.00
152	getting on the leaderboard	1.00	152	Being consistent in your shooting form	2.00
153	to get on leaderboard/8 or more	1.00	153	consistent form	2.00
154	get on the leaderboard	1.00	154	consistent with shooting form	2.00

The coding above is the final decisions used for the experiment. A simple inter-rater reliability method of percent agreement between the two coders was used. For ego instruction, 140/154 codes were initially agreed upon by the coders, for a 90.91% original agreement rate. For task instruction, 134/154 codes were initially agreed upon by the coders, for an 87.01% original agreement rate. For the codes not agreed upon, discussion and justification between the coders was had until a final agreement was made.

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